Kawasaki

MULE 3010 DIESEL 4×4



Utility Vehicle Service Manual

Quick Reference Guide

General Information	1
Periodic Maintenance	2
Fuel System	3
Cooling System	4
Engine Top End	5
Converter System	6
Engine Lubrication System	7
Engine Removal/Installation	8
Crankshaft/Crankcase	9
Transmission	10
Wheels/Tires	11
Final Drive	12
Brakes	13
Suspension	14
Steering	15
Frame	16
Electrical System	17
Appendix	18

This quick reference guide will assist you in locating a desired topic or procedure.

- Bend the pages back to match the black tab of the desired chapter number with the black tab on the edge at each table of contents page.
- Refer to the sectional table of contents for the exact pages to locate the specific topic required.

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All information contained in this publication is based on the latest product information available at the time of publication. Illustrations and photographs in this publication are intended for reference use only and may not depict actual model component parts.

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LIST OF ABBREVIATIONS

A	ampere(s)	lb	pounds(s)
ABDC	after bottom dead center	m	meter(s)
AC	alternating current	min	minute(s)
ATDC	after top dead center	N	newton(s)
BBDC	before bottom dead center	Pa	pascal(s)
BDC	bottom dead center	PS	horsepower
BTDC	before top dead center	psi	pound(s) per square inch
°C	degree(s) Celsius	r	revolution
DC	direct current	rpm	revolution(s) per minute
F	farad(s)	TDC	top dead center
°F	degree(s) Fahrenheit	TIR	total indicator reading
ft	foot, feet	V	volt(s)
g	gram(s)	W	watt(s)
h	hour(s)	Ω	ohm(s)
L	liter(s)		

COUNTRY AND AREA CODES

CA	Canada	EUR	Europe
US	United States		

EMISSION CONTROL INFORMATION

To protect the environment in which we all live, Kawasaki has incorporated crankcase emission (1) and exhaust emission (2) control systems in compliance with applicable regulations of the United States Environmental Protection Agency and California Air Resources Board.

1. Crankcase Emission Control System

A sealed-type crankcase emission control system is used to eliminate blow-by gases. The blow -by gases are led to the breather chamber through the crankcase to the inlet manifold.

Oil is separated from the gases while passing through the inside of the breather chamber from the crankcase, and then returned to the bottom of the crankcase.

2. Exhaust Emission Control System

The exhaust emission control system applied to this engine family is engine modifications that consist of a modified injection pump and injection timing characteristics.

The fuel system has been calibrated to provide lean air/fuel mixture characteristics, with a suitable air cleaner and exhaust system.

A maintenance free injection system provides the most appropriate injection timing and helps maintain a thorough combustion process within the engine which contributes to a reduction of exhaust pollutants entering the atmosphere.

The Clean Air Act, which is the Federal law covering motor vehicle pollution, contains what is commonly referred to as the Act's "tampering provisions".

"Sec. 203(a) The following acts and the causing thereof are prohibited.

(3)(A) for any person to remove or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this title prior to its sale and delivery to the ultimate purchaser, or for any manufacturer or dealer knowingly to remove or render inoperative any such device or element of design after such sale and delivery to the ultimate purchaser.

(3)(B) for any person engaged in the business of repairing, servicing, selling, leasing, or trading motor vehicles or motor vehicle engines, or who operates a fleet of motor vehicles knowingly to remove or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this title following its sale and delivery to the ultimate purchaser..."

NOTE

○ *The phrase "remove or render inoperative any device or element of design" has been generally interpreted as follows.*

1. *Tampering does not include the temporary removal or rendering inoperative of devices or elements of design in order to perform maintenance.*
2. *Tampering could include.*
   - *a. Maladjustment of vehicle components such that the emission standards are exceeded.*
   - *b. Use of replacement parts or accessories which adversely affect the performance or durability of the vehicle.*
   - *c. Addition of components or accessories that result in the vehicle exceeding the standards.*
   - *d. Permanently removing, disconnecting, or rendering inoperative any component or element of design of the emission control systems.*

WE RECOMMEND THAT ALL DEALERS OBSERVE THESE PROVISIONS OF FEDERAL LAW, THE VIOLATION OF WHICH IS PUNISHABLE BY CIVIL PENALTIES NOT EXCEEDING $10 000 PER VIOLATION.

PLEASE DO NOT TAMPER WITH NOISE CONTROL SYSTEM (US Model only)

To minimize the noise emissions from this product, Kawasaki has equipped it with effective inlet and exhaust silencing systems. They are designed to give optimum performance while maintaining a low noise level. Please do not remove these systems, or alter them in any way which results in an increase in noise level.

Foreword

This manual is designed primarily for use by trained mechanics in a properly equipped shop. However, it contains enough detail and basic information to make it useful to the owner who desires to perform his own basic maintenance and repair work. A basic knowledge of mechanics, the proper use of tools, and workshop procedures must be understood in order to carry out maintenance and repair satisfactorily. Whenever the owner has insufficient experience or doubts his ability to do the work, all adjustments, maintenance, and repair should be carried out only by qualified mechanics.

In order to perform the work efficiently and to avoid costly mistakes, read the text, thoroughly familiarize yourself with the procedures before starting work, and then do the work carefully in a clean area. Whenever special tools or equipment are specified, do not use makeshift tools or equipment. Precision measurements can only be made if the proper instruments are used, and the use of substitute tools may adversely affect safe operation.

For the duration of the warranty period, we recommend that all repairs and scheduled maintenance be performed in accordance with this service manual. Any owner maintenance or repair procedure not performed in accordance with this manual may void the warranty.

To get the longest life out of your vehicle.

- Follow the Periodic Maintenance Chart in the Service Manual.
- Be alert for problems and non-scheduled maintenance.
- Use proper tools and genuine Kawasaki Vehicle parts. Special tools, gauges, and testers that are necessary when servicing Kawasaki vehicles are introduced by the Service Manual. Genuine parts provided as spare parts are listed in the Parts Catalog.
- Follow the procedures in this manual carefully. Don't take shortcuts.
- Remember to keep complete records of maintenance and repair with dates and any new parts installed.

How to Use This Manual

In this manual, the product is divided into its major systems and these systems make up the manual's chapters. The Quick Reference Guide shows you all of the product's system and assists in locating their chapters. Each chapter in turn has its own comprehensive Table of Contents.

For example, if you want engine oil information, use the Quick Reference Guide to locate the Engine Lubrication System chapter. Then, use the Table of Contents on the first page of the chapter to find the Engine Oil section.

Whenever you see these WARNING and CAUTION symbols, heed their instructions! Always follow safe operating and maintenance practices.

⚠ WARNING

This warning symbol identifies special instructions or procedures which, if not correctly followed, could result in personal injury, or loss of life.

CAUTION

This caution symbol identifies special instructions or procedures which, if not strictly observed, could result in damage to or destruction of equipment.

This manual contains four more symbols (in addition to WARNING and CAUTION) which will help you distinguish different types of information.

NOTE

○ *This note symbol indicates points of particular interest for more efficient and convenient operation.*

- ● Indicates a procedural step or work to be done.
- ○ Indicates a procedural sub-step or how to do the work of the procedural step it follows. It also precedes the text of a NOTE.
- ★ Indicates a conditional step or what action to take based on the results of the test or inspection in the procedural step or sub-step it follows.

In most chapters an exploded view illustration of the system components follows the Table of Contents. In these illustrations you will find the instructions indicating which parts require specified tightening torque, oil, grease or a locking agent during assembly.

General Information

Table of Contents

Before Servicing 1-2
Model Identification..... 1-7
General Specifications..... 1-8
Unit Conversion Table 1-11

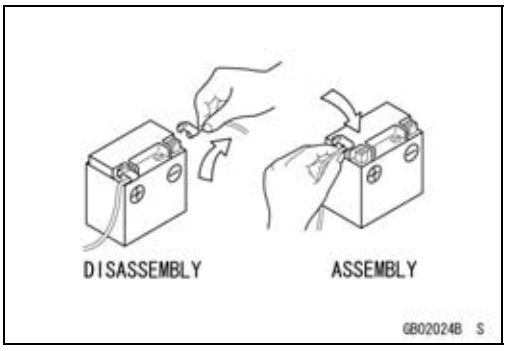
Before Servicing

Before starting to perform an inspection service or carry out a disassembly and reassembly operation on a vehicle, read the precautions given below. To facilitate actual operations, notes, illustrations, photographs, cautions, and detailed descriptions have been included in each chapter wherever necessary. This section explains the items that require particular attention during the removal and reinstallation or disassembly and reassembly of general parts.

Especially note the following.

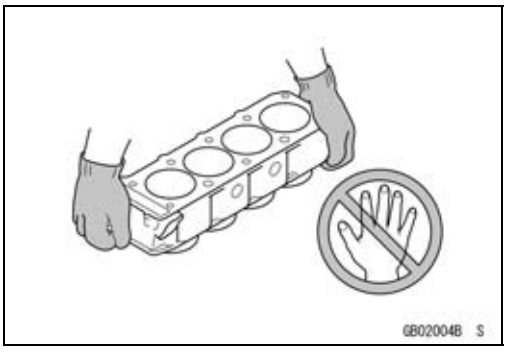
Battery Ground

Before completing any service on the vehicle, disconnect the battery cables from the battery to prevent the engine from accidentally turning over. Disconnect the ground cable (–) first and then the positive (+). When completed with the service, first connect the positive (+) cable to the positive (+) terminal of the battery then the negative (–) cable to the negative terminal.



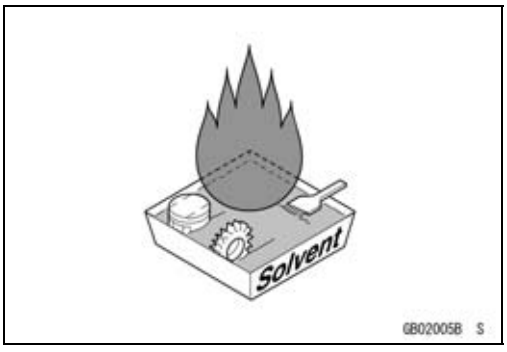
Edges of Parts

Lift large or heavy parts wearing gloves to prevent injury from possible sharp edges on the parts.



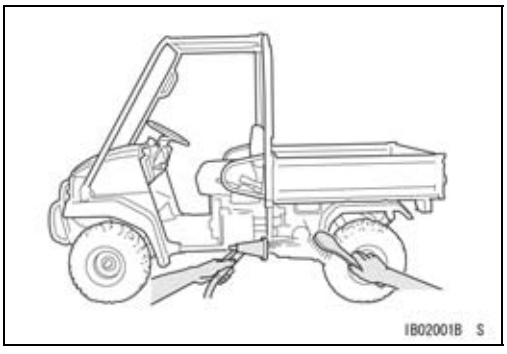
Solvent

Use a high-flush point solvent when cleaning parts. High -flush point solvent should be used according to directions of the solvent manufacturer.



Cleaning Vehicle before Disassembly

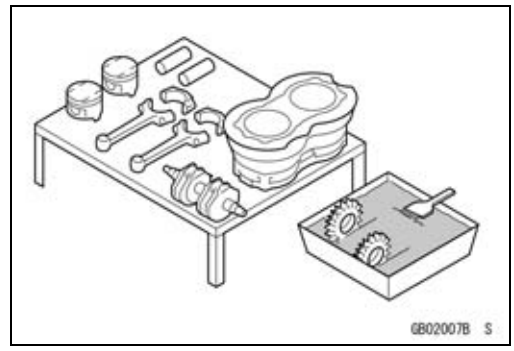
Clean the vehicle thoroughly before disassembly. Dirt or other foreign materials entering into sealed areas during vehicle disassembly can cause excessive wear and decrease performance of the vehicle.



Before Servicing

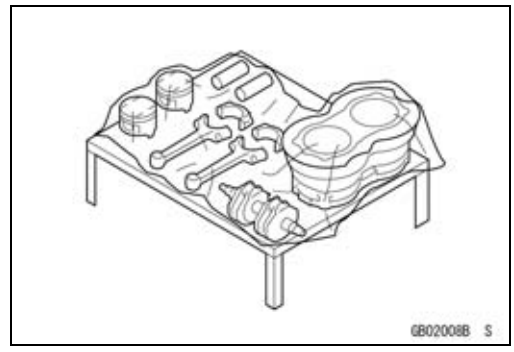
Arrangement and Cleaning of Removed Parts

Disassembled parts are easy to confuse. Arrange the parts according to the order the parts were disassembled and clean the parts in order prior to assembly.



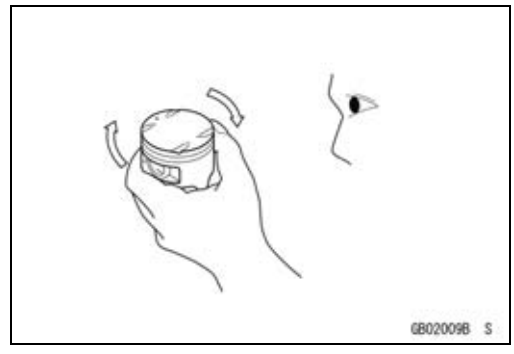
Storage of Removed Parts

After all the parts including subassembly parts have been cleaned, store the parts in a clean area. Put a clean cloth or plastic sheet over the parts to protect from any foreign materials that may collect before re-assembly.



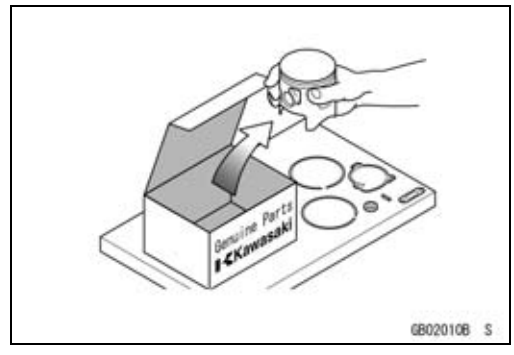
Inspection

Reuse of worn or damaged parts may lead to serious accident. Visually inspect removed parts for corrosion, discoloration, or other damage. Refer to the appropriate sections of this manual for service limits on individual parts. Replace the parts if any damage has been found or if the part is beyond its service limit.



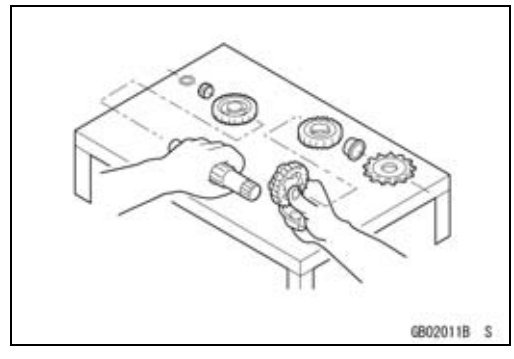
Replacement Parts

Replacement Parts must be KAWASAKI genuine or recommended by KAWASAKI. Gaskets, O-rings, oil seals, grease seals, circlips or cotter pins must be replaced with new ones whenever disassembled.



Assembly Order

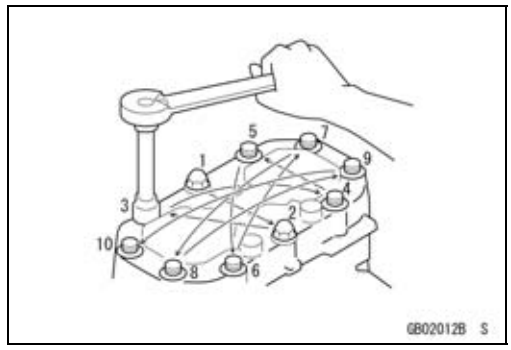
In most cases assembly order is the reverse of disassembly, however, if assembly order is provided in this Service Manual, follow the procedures given.



Before Servicing

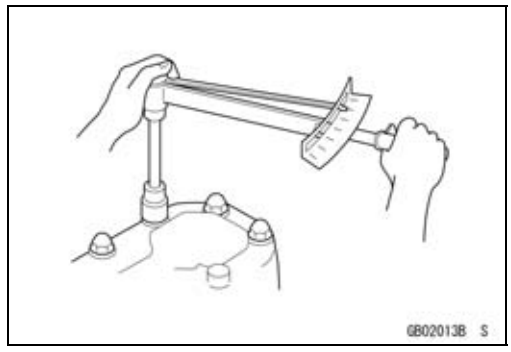
Tightening Sequence

Generally, when installing a part with several bolts, nuts, or screws, start them all in their holes and tighten them to a snug fit. Then tighten them according to the specified sequence to prevent case warpage or deformation which can lead to malfunction. Conversely when loosening the bolts, nuts, or screws, first loosen all of them by about a quarter turn and then remove them. If the specified tightening sequence is not indicated, tighten the fasteners alternating diagonally.



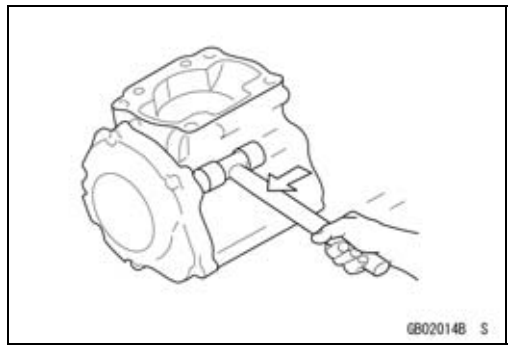
Tightening Torque

Incorrect torque applied to a bolt, nut, or screw may lead to serious damage. Tighten fasteners to the specified torque using a good quality torque wrench.



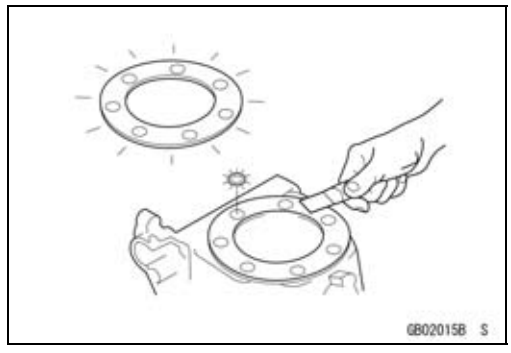
Force

Use common sense during disassembly and assembly, excessive force can cause expensive or hard to repair damage. When necessary, remove screws that have a non-permanent locking agent applied using an impact driver. Use a plastic-faced mallet whenever tapping is necessary.



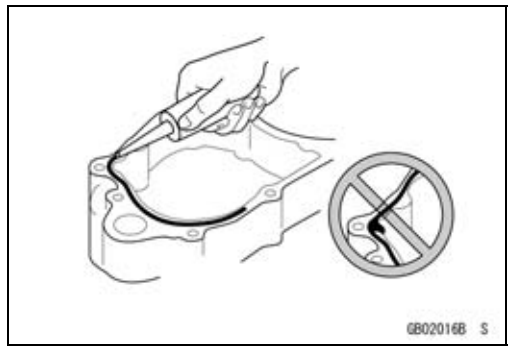
Gasket, O-ring

Hardening, shrinkage, or damage of both gaskets and O-rings after disassembly can reduce sealing performance. Remove old gaskets and clean the sealing surfaces thoroughly so that no gasket material or other material remains. Install the new gaskets and replace the used O-rings when re-assembling.



Liquid Gasket, Non-permanent Locking Agent

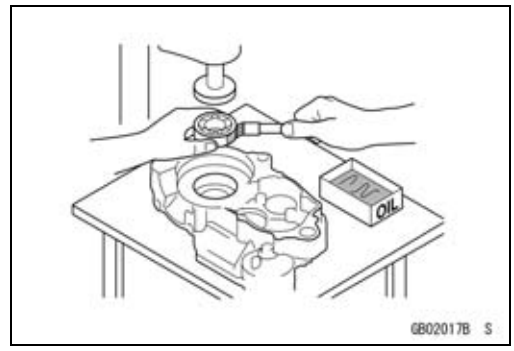
For applications that require Liquid Gasket or a Non-permanent Locking Agent, clean the surfaces so that no oil residue remains before applying liquid gasket or non-permanent locking agent. Do not apply them excessively. Excessive application can clog oil passages and cause serious damage.



Before Servicing

Press

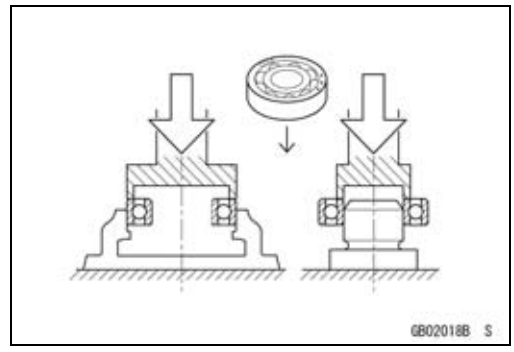
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.



Ball Bearing and Needle Bearing

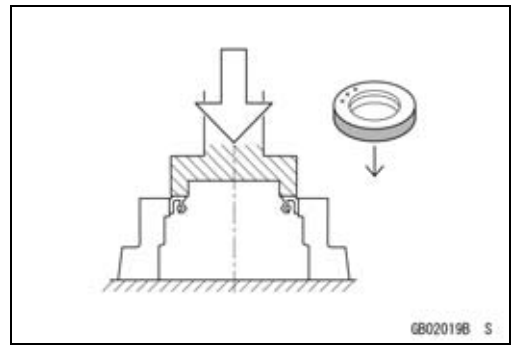
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

Pressing the incorrect race can cause pressure between the inner and outer race and result in bearing damage.

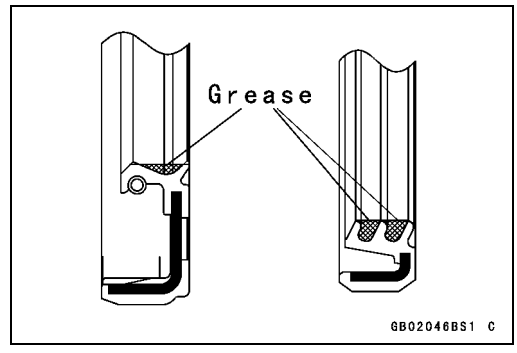


Oil Seal, Grease Seal

Do not remove pressed oil or grease seals unless removal is necessary. Replace with new ones whenever removed. Press new oil seals with manufacture and size marks facing out. Make sure the seal is aligned properly when installing.

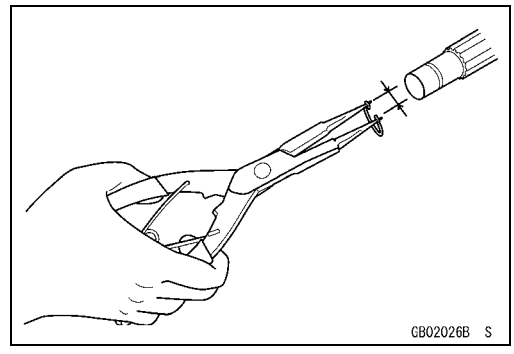


Apply specified grease to the lip of seal before installing the seal.



Circlips, Cotter Pins

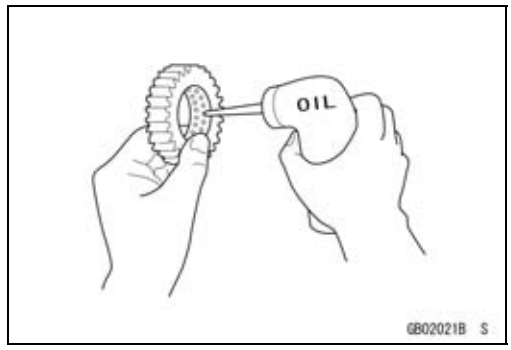
Replace the circlips or cotter pins that were removed with new ones. Take care not to open the clip excessively when installing to prevent deformation.



Before Servicing

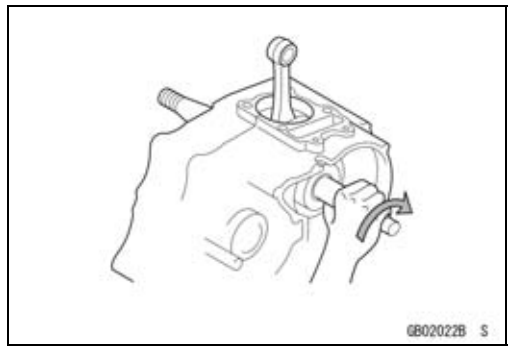
Lubrication

It is important to lubricate rotating or sliding parts during assembly to minimize wear during initial operation. Lubrication points are called out throughout this manual, apply the specific oil or grease as specified.



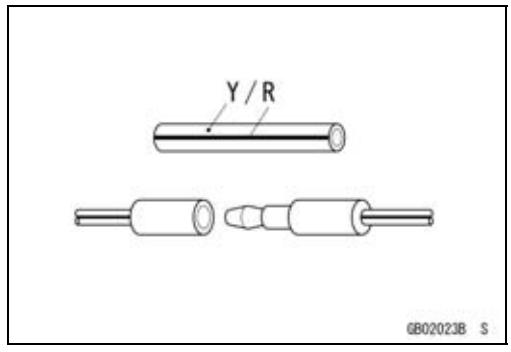
Direction of Engine Rotation

When rotating the crankshaft by hand, the free play amount of rotating direction will affect the adjustment. Rotate the crankshaft to positive direction (clockwise viewed from right side).



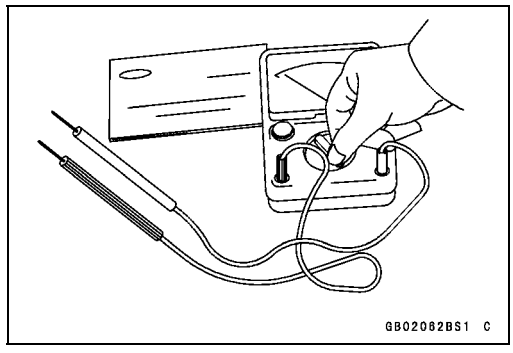
Electrical Wires

A two-color wire is identified first by the primary color and then the stripe color. Unless instructed otherwise, electrical wires must be connected to those of the same color.



Instrument

Use a meter that has enough accuracy for an accurate measurement. Read the manufacture's instructions thoroughly before using the meter. Incorrect values may lead to improper adjustments.



Model Identification

KAF950D8F Left Side View



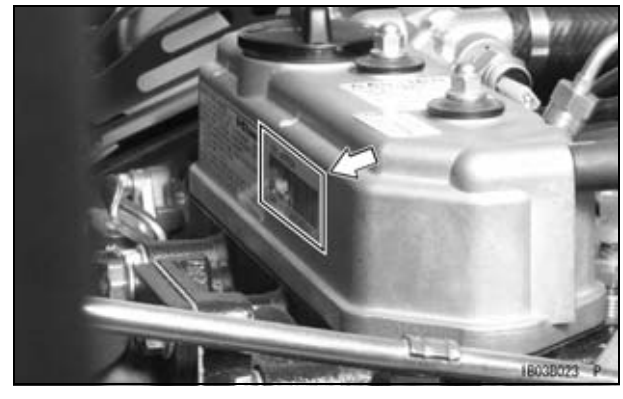
KAF950D8F Right Side View



Frame Number



Engine Number



General Specifications

Items	KAF950D8F
Dimensions	
Overall Length	2 861 (112.64 in.)
Overall Width	1 440 mm (56.69 in.)
Overall Height	1 930 mm (75.98 in.)
Wheelbase	1 870 mm (73.62 in.)
Track:	
Front	1 160 mm (45.67 in.)
Rear	1 180 mm (46.46 in.)
Ground Clearance	175 mm (6.89 in.)
Seat Height	875 mm (34.45 in.)
Dry Weight	685 kg (1 510 lb)
Curb Weight:	
Front	317 kg (699 lb)
Rear	399 kg (880 lb)
Fuel Tank Capacity	20 L (5.3 US gal.)
Cargo Bed (L × W × H)	1 175 × 1 310 × 288 mm (46.26 × 51.57 × 11.34 in.)
Seating Capacity	2
Performance	
Minimum Turning Radius	3.4 m (11.2 ft)
Engine	
Type	4-stroke, OHV, Diesel, 3-cylinders
Cooling System	Liquid-cooled
Bore and Stroke	72 × 78 mm (2.83 × 3.07 in.)
Displacement	953 cm³ (58.2 cu in.)
Compression Ratio	24.8
Maximum Horsepower	17.7 kW (24 PS) @3 600 r/min (rpm) (CA), (US) – – –
Maximum Torque	52 N·m (5.3 kgf·m, 38.4 ft·lb) @2 800 r/min (rpm) (CA), (US) – – –
Injection Pump	Denso VE type
Starting System	Electric starter
Cylinder Numbering Method	Right to left, 1-2-3
Firing Order	Right to left, 1-2-3
Valve Timing:	
Inlet:	
Open	10° BTDC
Close	45° ABDC
Duration	235°
Exhaust:	
Open	45° BBDC
Close	10° ATDC
Duration	235°

General Specifications

Items	KAF950D8F
Lubrication System	Forced lubrication (wet sump)
Engine Oil:	
Grade	API CF or CF-4
Viscosity	SAE 10W-40
Capacity	3.3 L (3.5 US qt)
Drive Train	
Primary Reduction System:	
Type	Belt drive torque converter
Reduction Ratio	3.7 ~ 0.98
Transmission Gear Ratio:	
Forward:	
High	1.821 (51/28)
Low	3.750 (51/28 × 25/20 × 28/17)
Reverse:	
Low	4.220 (41/20 × 25/20 × 28/17)
Final Drive System:	
Type	Gear 4WD/2WD
Reduction Ratio	5.429 (76/14)
Overall Drive Ratio:	
Forward:	
High	9.690
Low	19.950
Reverse:	
Low	22.454
Front Final Gear Case Oil:	
Type	Hypoid gear oil for LSD (Limited Slip Differential gears)
Viscosity	SAE 140 (GL-5) or SAE 90 (GL-6)
Capacity	0.4 L (0.4 US qt)
Transmission Oil:	
Type	Hypoid gear oil
Viscosity	SAE 90: above 5°C (41°F) or SAE 80: below 5°C (41°F)
Capacity	2.5 L (2.6 US qt)
Frame	
Type	Steel tube, Ladder
Caster (Rake Angle)	7.5°
Camber	0.8°
Trail	35 mm (1.4 in.)
Tire:	
Front and Rear	23 × 11.00-10, Tubeless
Rim Size:	
Front and Rear	10 × 8.5
Steering Type	Rack and pinion (Electric power steering)

General Specifications

Items	KAF950D8F
Suspension:	
Front:	
Type	MacPherson strut
Wheel Travel	100 mm (3.94 in.)
Rear:	
Type	De Dion axle
Wheel Travel	70 mm (2.76 in.)
Brake Type:	
Front and Rear	Drum (Hydraulic)
Parking Brake Type	Drum (Mechanical internal expansion)
Electrical Equipment	
Battery	12 V 52 Ah
Headlight:	
Type	Semi-sealed beam
Bulb	12 V 30 W × 2
Brake/Tail Light	12 V 21/5 W × 2
Reverse Light	(EUR) 12 V 10 W
Alternator:	
Type	Three-phase AC
Rated Output	40 A, 12 V
Load Capacity	
Maximum Vehicle Load	740 kg (1 632 lb)
(Including Occupants and Cargo)	
Maximum Cargo Bed Load	499 kg (1 100 lb)

Specifications are subject to change without notice, and may not apply to every country.

Unit Conversion Table

Prefixes for Units:

Prefix	Symbol	Power
mega	M	× 1 000 000
kilo	k	× 1 000
centi	c	× 0.01
milli	m	× 0.001
micro	μ	× 0.000001

Units of Mass:

kg	×	2.205	=	lb
g	×	0.03527	=	oz

Units of Volume:

L	×	0.2642	=	gal (US)
L	×	0.2200	=	gal (imp)
L	×	1.057	=	qt (US)
L	×	0.8799	=	qt (imp)
L	×	2.113	=	pint (US)
L	×	1.816	=	pint (imp)
mL	×	0.03381	=	oz (US)
mL	×	0.02816	=	oz (imp)
mL	×	0.06102	=	cu in

Units of Force:

N	×	0.1020	=	kg
N	×	0.2248	=	lb
kg	×	9.807	=	N
kg	×	2.205	=	lb

Units of Length:

km	×	0.6214	=	mile
m	×	3.281	=	ft
mm	×	0.03937	=	in

Units of Torque:

N·m	×	0.1020	=	kgf·m
N·m	×	0.7376	=	ft·lb
N·m	×	8.851	=	in·lb
kgf·m	×	9.807	=	N·m
kgf·m	×	7.233	=	ft·lb
kgf·m	×	86.80	=	in·lb

Units of Pressure:

kPa	×	0.01020	=	kgf/cm²
kPa	×	0.1450	=	psi
kPa	×	0.7501	=	cmHg
kgf/cm²	×	98.07	=	kPa
kgf/cm²	×	14.22	=	psi
cmHg	×	1.333	=	kPa

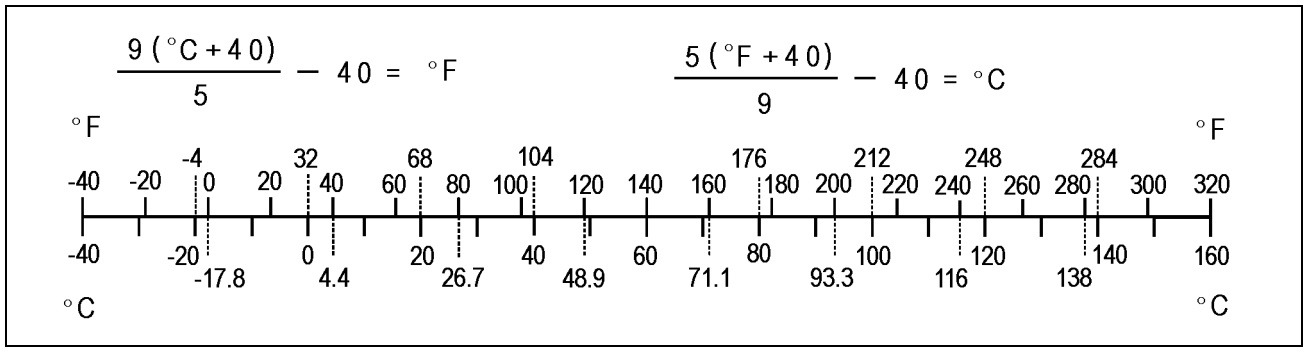
Units of Speed:

km/h	×	0.6214	=	mph

Units of Power:

kW	×	1.360	=	PS
kW	×	1.341	=	HP
PS	×	0.7355	=	kW
PS	×	0.9863	=	HP

Units of Temperature:



Periodic Maintenance

Table of Contents

Periodic Maintenance Chart 2-3
Torque and Locking Agent 2-5
Specifications 2-10
Special Tools 2-12
Periodic Maintenance Procedures 2-13
  Fuel System 2-13
    Throttle Pedal Play Inspection 2-13
    Throttle Pedal Play Adjustment 2-13
    Idle Speed Inspection 2-14
    Idle Speed Adjustment 2-14
    Fuel Hoses and Connections Inspection 2-14
    Fuel Hoses Replacement 2-14
    Fuel Filter Element Replacement 2-16
    Fuel Filter Water Draining 2-16
  Cooling System 2-16
    Radiator Cleaning 2-16
    Radiator Hose and Connection Inspection 2-17
    Coolant Change 2-17
    Cooling Fan Belt Inspection 2-20
  Engine Top End 2-22
    Valve Clearance Inspection 2-22
    Valve Clearance Adjustment 2-23
    Spark Arrester Cleaning 2-23
  Converter System 2-24
    Drive Belt Inspection 2-24
    Drive Belt Deflection Inspection 2-24
    Drive Belt Deflection Adjustment 2-25
    Converter Driven Pulley Shoe Inspection 2-25
    Converter Air Cleaner Element Cleaning/Inspection 2-26
  Engine Lubrication System 2-27
    Engine Oil and/or Oil Filter Change 2-27
    Oil Filter Removal 2-28
    Oil Filter Installation 2-28
  Transmission 2-28
    Transmission Oil Change 2-28
  Wheels/Tires 2-29
    Wheels Nuts Tightness Inspection 2-29
    Tire Wear Inspection 2-29
  Final Drive 2-29
    Front Final Gear Case Oil Change 2-29
  Brakes 2-30
    Brake Fluid Level Inspection 2-30
    Brake Fluid Change 2-31
    Brake Pedal Play Inspection 2-32
    Brake Master Cylinder Cup and Dust Seal Replacement 2-33
    Brake Hose and Pipe Inspection 2-33
    Brake Hose and Pipe Replacement 2-34
    Brake Wear Inspection 2-35
    Brake Wheel Cylinder Assembly Replacement 2-36
    Parking Brake Lever Inspection 2-38

Steering 2-40
Steering Inspection 2-40
Steering Joint Dust Boot Inspection 2-40
Frame 2-41
Seat Belt Inspection 2-41
Electrical System 2-41
Electrolyte Level Inspection (Conventional Type Battery) 2-41
Electrolyte Specific Gravity Inspection (Conventional Type Battery) 2-42
Charging Condition Inspection (Conventional Type Battery) 2-43
Brake Light Switch Inspection 2-43
General Lubrication 2-44
Bolts, Nuts and Fasteners Tightness Inspection 2-46

Periodic Maintenance Chart

The scheduled maintenance must be done in accordance with this chart to keep the vehicle in good running condition. **The initial maintenance is vitally important and must not be neglected.**

FREQUENCY / OPERATION	Whichever comes first → ↓ Every	First Service	Regular Service				See Page
		After 50 h, or 1 000 km of use	Every 100 h, or 2 000 km of use	Every 250 h, or 5 000 km of use	Every 500 h, or 10 000 km of use	Every 800 h, or 16 000 km of use	
ENGINE							
Throttle pedal play - inspect		●			●		2-13
Idle speed - adjust		●		●			2-14
Fuel hoses and connections - inspect*		●		●			2-14
Fuel hose - replace	4 years						2-14
Fuel filter element - replace*						●	2-16
Fuel filter water - drain*			●				2-16
Radiator - clean*		●		●			2-16
Radiator hoses and connections - inspect*	1 year	●			●		2-17
Coolant - change	2 years						2-17
Cooling fan belt - inspect			●				2-20
Valve clearance - inspect*					●		2-22
Spark arrester - clean				●			2-23
Converter drive belt - inspect*				●			2-24
Converter drive belt deflection - inspect*				●			2-24
Converter driven pulley shoe - inspect*					●		2-25
Converter air cleaner element - clean*		●		●			2-26
Engine oil - change*	1 year	●	●				2-27
Oil filter - replace		●		●			2-28

●: Clean, adjust, lubricate, torque, or replace parts as necessary.

*: Service more frequently when operated in mud, dust, or other harsh riding conditions.

2-4 PERIODIC MAINTENANCE

Periodic Maintenance Chart

FREQUENCY / OPERATION	Whichever comes first → ↓ Every	First Service	Regular Service				See Page
		After 50 h, or 1 000 km of use	Every 100 h, or 2 000 km of use	Every 250 h, or 5 000 km of use	Every 500 h, or 10 000 km of use	Every 800 h, or 16 000 km of use	
CHASSIS							
Front final gear case oil and transmission case oil - change*	1 year	●			●		2-28, 2-29
Wheel nuts tightness - inspect		●		●			2-29
Tire wear - inspect*		●		●			2-29
Brake fluid level - inspect		●		●			2-30
Brake fluid - change	2 years						2-31
Brake pedal play - inspect*		●		●			2-32
Brake master cylinder cup and dust seal - replace	2 years						2-33
Brake hose and pipe - inspect		●		●			2-33
Brake hose - replace	4 years						2-34
Brake wear - inspect*				●			2-35
Brake wheel cylinder assembly - replace	2 years						2-36
Parking brake lever - inspect		●		●			2-38
Steering - inspect		●		●			2-40
Steering joint dust boots - inspect		●		●			2-40
Seat belt - inspect				●			2-41
Battery - inspect (Note 1)				●			2-41
Brake light switch - inspect		●		●			2-43
General lubrication - perform*				●			2-44
Bolts, nuts, and fasteners tightness - inspect		●		●			2-46

●: Clean, adjust, lubricate, torque, or replace parts as necessary.

*: Service more frequently when operated in mud, dust, or other harsh riding conditions.

Note 1: Conventional Type Battery

Torque and Locking Agent

The following tables list the tightening torque for the major fasteners requiring use of a non-permanent locking agent or silicone sealant etc.

Letters used in the “Remarks” column mean:
B: Apply brake fluid.
EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
MO: Apply molybdenum disulfide grease oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
S: Follow the specified tightening sequence.
SS: Apply silicone sealant.

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Fuel System				
Air Vent Plug	5.0	0.51	44 in·lb	
Distributor Head Bolt	17	1.7	13	
Fuel Filter Mounting Bolts	20	2.0	15	
Fuel Injection Nozzles	59	6.0	44	
Fuel Injection Pipe Clamp Bolts	7.4	0.75	65 in·lb	
Fuel Injection Pipe Mounting Nuts	25	2.5	18	
Fuel Injection Pump Bracket Bolts	20	2.0	15	
Fuel Injection Pump Gear Nut	64	6.5	47	
Fuel Injection Pump Mounting Nuts	20	2.0	15	
Idle Adjusting Screw Locknut	6.9	0.70	61 in·lb	
Linkage Pipe Nuts	27	2.8	20	
Maximum Speed Set Screw Locknut	6.9	0.70	61 in·lb	
Cooling System				
Coolant Drain Plug	25	2.5	18	L
Coolant Inlet Bolts	7.8	0.80	69 in·lb	
Coolant Reserve Tank Bolt	4.4	0.45	39 in·lb	
Coolant Temperature Switch	27	2.8	20	L
Fan Mounting Bolts	8.8	0.90	78 in·lb	
Radiator Fan Mounting Bolts	6.0	0.61	53 in·lb	
Radiator Fan Switch	25	2.5	18	
Radiator Mounting Bolts	8.8	0.90	78 in·lb	
Radiator Screen Mounting Bolts	8.8	0.90	78 in·lb	
Shroud Mounting Bolts	6.0	0.61	53 in·lb	
Thermostat Housing Cap Bolts	7.8	0.80	69 in·lb	
Water Pipe Mounting Bolts	8.8	0.90	78 in·lb	
Water Pump Mounting Bolts and Nuts	20	2.0	15	
Engine Top End				
Cylinder Head Bolts	34	3.5	25	EO, S
Cylinder Head Cover Nuts	5.4	0.55	48 in·lb	
Exhaust Manifold Mounting Nuts	20	2.0	15	
Inlet Manifold Mounting Bolts	7.8	0.80	69 in·lb	
Inlet Manifold Mounting Nuts	7.8	0.80	69 in·lb	

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Rocker Arm Components Mounting Nuts	20	2.0	15	
Valve Adjusting Screw Locknuts	11	1.1	97 in·lb	
Converter System				
Converter Case Bolts (L = 55 mm)	27	2.8	20	L
Converter Case Bolts (L = 28 mm)	20	2.0	15	L
Converter Cover Bolts	4.4	0.45	39 in·lb	
Drive Pulley Bolt	93	9.5	69	
Drive Pulley Cover Bolts	13	1.3	115 in·lb	
Driven Pulley Bolt	93	9.5	69	L
Fan Cover Bolts	8.8	0.90	78 in·lb	
Inner Cover Bolts	4.4	0.45	39 in·lb	
Inner Cover Nut	8.8	0.90	78 in·lb	
Ramp Weight Nuts	6.9	0.70	61 in·lb	
Spider	275	28.0	203	
Wear Shoe Mounting Screws	1.1	0.11	10 in·lb	L
Engine Lubrication System				
Engine Oil Drain Plugs	34	3.5	25	
Oil Filter Stud Bolt	44	4.5	32	
Oil Nozzle	14	1.4	10	
Oil Pan Bolts and Nuts	7.8	0.80	69 in·lb	
Oil Pressure Switch	14	1.4	10	SS
Oil Pump Drive Gear Bolt	20	2.0	15	
Oil Strainer Mounting Bolt and Nuts	7.8	0.80	69 in·lb	
Relief Valve Bolt	39	4.0	29	
Engine Removal/Installation				
Engine Mounting Bolts	44	4.5	32	
Stay Rod Rear Nut	88	9.0	65	
Crankshaft/Crankcase				
Camshaft Drive Gear Bolt	43	4.4	32	
Camshaft Retainer Bolts	7.8	0.80	69 in·lb	
Connecting Rod Cap Nuts	36	3.7	27	
Coolant Drain Plug	25	2.5	18	L
Crankshaft Main Bearing Cap Bolts	59	6.0	44	
Crankshaft Pulley Bolt	98	10.0	72.3	EO
End Plate Bolts	39	4.0	29	
Flywheel Mounting Bolts	44	4.5	32	L, S
Fuel Injection Pump Drive Gear Nut	64	6.5	47	
Idle Gear Bolts	25	2.5	18	
Oil Nozzle	14	1.4	10	
Oil Pump Drive Gear Bolt	20	2.0	15	
Oil Seal Retainer Bolts	5.4	0.55	48 in·lb	
Timing Gear Case Bolts	7.8	0.80	69 in·lb	
Timing Gear Case Cover Bolts	7.8	0.80	69 in·lb	

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Transmission				
Bearing Holder	118	12.0	87.0	MO
Differential Gear Housing Bolts	57	5.8	42	L
Hi/Low Gear Case Bolts	20	2.0	15	
Neutral Switch	15	1.5	11	
Shift Arm Positioning Bolt	37	3.8	27	
Shift Shaft Stop Bolt	7.8	0.80	69 in·lb	
Transmission Case Bolts	8.8	0.90	78 in·lb	
Transmission Case Mounting Nuts	44	4.5	32	
Transmission Oil Drain Plug	15	1.5	11	
Wheels/Tires				
Wheel Nuts	137	14.0	101	
Final Drive				
Bearing Holder	118	12.0	87.0	L
Bevel Gear Case Bolts	22	2.2	16	
Bevel Gear Case Holder Nuts	25	2.5	18	
Differential Case Torx Bolts	32	3.3	24	L
Drive Gear Nut	118	12.0	87.0	MO
Drive Shaft Cap Bolts	20	2.0	15	
Driven Gear Shaft Nut	108	11.0	79.7	L
Front Axle Cap Bolts	8.8	0.90	78 in·lb	
Gear Case Bracket Bolts	44	4.5	32	
Gear Case Mounting Nuts	44	4.5	32	
Grease Nipple	2.3	0.23	20 in·lb	G
Housing Locknut	118	12.0	87.0	L
Oil Drain Plug	20	2.0	15	
Oil Filler Cap	29	3.0	21	
Pinion Gear Bearing Housing Nuts	25	2.5	18	
Pinion Gear Slotted Nut	118	12.0	87.0	MO
Propeller Shaft Bearing Housing Cover Bolts	3.4	0.35	30 in·lb	
Ring Gear Bolts	49	5.0	36	
Ring Gear Cover Bolts (M10)	47	4.8	35	
Ring Gear Cover Bolts (M8)	25	2.5	18	
Speed Sensor Bolt	8.8	0.90	78 in·lb	
Brakes				
Bleed Valves	5.4	0.55	48 in·lb	
Brake Hose Banjo Bolts	25	2.5	18	
Brake Pipe Nipples	18	1.8	13	B
Front Axle Nuts	196	20.0	145	
Front Brake Panel Mounting Bolts	44	4.5	32	L
Front Wheel Cylinder Mounting Bolts	10.3	1.1	91 in·lb	
Master Cylinder Reservoir Cap	3.4	0.35	30 in·lb	
Piston Stop Bolt	8.8	0.90	78 in·lb	

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Push Rod Locknut	17.2	1.8	13	
Rear Axle Nuts	304	31.0	224	
Rear Brake Panel Mounting Bolts	44	4.5	32	L
Rear Wheel Cylinder Mounting Nuts	7.4	0.75	65 in·lb	
Reservoir Clamp Bolt	6.1	0.62	54 in·lb	
Suspension				
Damper Bracket Mounting Nuts	59	6.0	44	S
Front Suspension Arm Joint Nuts	78	8.0	58	
Front Suspension Arm Pivot Bolts	98	10.0	72.3	L
Leaf Spring Mounting Nuts (Front)	98	10.0	72.3	
Leaf Spring Mounting Nuts (Rear)	59	6.0	44	
Rear Shock Absorber Mounting Nuts	59	6.0	44	
Strut Clamp Nuts	98	10.0	72.3	
Strut Locknuts	49	5.0	36	
Strut Mounting Locknuts	44	4.5	32	
Tie-Rod End Nuts	34	3.5	25	
Steering				
EPS Unit Mounting Bolts	20	2.0	15	S
Rack Guide Spring Cap Locknut	39	4.0	29	
Steering Gear Assembly Bracket Bolts	52	5.3	38	L, S
Steering Wheel Mounting Nut	52	5.3	38	
Strut Clamp Nuts	98	10.0	72.3	
Tie-Rod End Locknuts	49	5.0	36	
Tie-Rod End Nuts	34	3.5	25	
Universal Joint Clamp Bolts	20	2.0	15	S
Frame				
Battery Holder Mounting Nuts	17	1.7	13	
Front Bar Mounting Bolts (Lower)	98	10.0	72.3	
Front Bar Mounting Bolts (Upper)	44	4.5	32	
Hood Latch Lever Mounting Bolts	37	3.8	27	L
Rear Bar Mounting Bolts	44	4.5	32	
Rear End Subframe Mounting Nuts	44	4.5	32	
Seat Belt Buckle Mounting Bolts	34	3.5	25	
Seat Belt Mounting Bolts	34	3.5	25	
Stay Rod Rear Nut	88	9.0	65	
Tail Gate Fixing Lever Screws	4.4	0.45	39 in·lb	L
Electrical System				
Alternator Adjusting Bracket Bolts	20	2.0	15	
Alternator Mounting Bolt	39	4.0	29	
Alternator Pulley Locknut	11	1.1	97 in·lb	
Battery Holder Mounting Nuts	17	1.7	13	
Connecting Plate Nuts	1.2	0.12	11 in·lb	
Coolant Temperature Switch	27	2.8	20	L

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Glow Plugs	17	1.7	13	SS
Neutral Switch	15	1.5	11	
Oil Pressure Switch	14	1.4	10	
Radiator Fan Switch	25	2.5	18	
Speed Sensor Bolt	8.8	0.90	78 in·lb	
Starter Motor End Cover Screws	1.5	0.15	13 in·lb	
Starter Motor Mounting Bolts	39	4.0	29	
Starter Motor Through Bolts	9.3	0.95	82 in·lb	

The table below, relating tightening torque to thread diameter, lists the basic torque for the bolts and nuts. Use this table for only the bolts and nuts which do not require a specific torque value. All of the values are for use with dry solvent-cleaned threads.

Basic Torque for General Fasteners of Engine Parts

Threads Diameter (mm)	Mark of bolt head	Torque		
		N·m	kgf·m	ft·lb
6	4T	3.9 ~ 4.9	0.40 ~ 0.50	35 ~ 43 in·lb
6	7T	7.8 ~ 9.8	0.80 ~ 1.0	69 ~ 87 in·lb
6	9T	12 ~ 15	1.2 ~ 1.5	104 ~ 130 in·lb
8	4T	10 ~ 14	1.0 ~ 1.4	87 ~ 120 in·lb
8	7T	18 ~ 22	1.8 ~ 2.2	13 ~ 16
10	4T	20 ~ 24	2.0 ~ 2.4	14 ~ 17
10	7T	39 ~ 44	4.0 ~ 4.5	29 ~ 33

Basic Torque for General Fasteners of Frame Parts

Threads Diameter (mm)	Torque		
	N·m	kgf·m	ft·lb
5	3.4 ~ 4.9	0.35 ~ 0.50	30 ~ 43 in·lb
6	5.8 ~ 7.9	0.60 ~ 0.80	52 ~ 69 in·lb
8	14 ~ 19	1.4 ~ 1.9	10 ~ 14
10	26 ~ 34	2.6 ~ 3.5	19 ~ 25
12	44 ~ 61	4.5 ~ 6.2	33 ~ 45

Specifications

Item	Standard	Service Limit
Fuel System		
Throttle Pedal Play	5 ~ 10 mm (0.20 ~ 0.39 in.)	– – –
Idle Speed	850 ~ 950 r/min (rpm)	– – –
Cooling System		
Coolant:		
Type (Recommended)	Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)	– – –
Color	Green	– – –
Mixed Ratio	Soft water 50%, coolant 50%	– – –
Freezing Point	–35°C (–31°F)	– – –
Total Amount	4.1 L (4.3 US qt)	– – –
Fan Belt Deflection	9.5 ~ 11.5 mm (0.37 ~ 0.45 in.) at 98 N (10 kgf, 22 lb)	– – –
Engine Top End		
Valve Clearance	0.20 mm (0.0079 in.)	– – –
Converter System		
Belt Width	34.1 mm (1.34 in.)	32.6 mm (1.28 in.)
Belt Deflection	28 ~ 36 mm (1.10 ~ 1.42 in.)	– – –
Wear Shoe Width	– – –	16.4 mm (0.65 in.)
Engine Lubrication System		
Engine Oil:		
Grade	API CF or CF-4	– – –
Viscosity	SAE 10W-40	– – –
Capacity	3.0 L (3.2 US qt) (When filter is not removed)	– – –
	3.3 L (3.5 US qt) (When filter is removed)	– – –
Oil Level	Between F and L marks on dipstick	– – –
Transmission		
Transmission Oil:		
Type	Hypoid gear oil	– – –
Viscosity	SAE 90: above 5°C (41°F) or	– – –
	SAE 80: below 5°C (41°F)	– – –
Capacity	2.5 L (2.6 US qt)	– – –
Oil Level	Between H and L level lines on dipstick	– – –
Wheels/Tires		
Tire Tread Depth	13.2 mm (0.52 in.)	3 mm (0.12 in.)
Final Drive		
Front Final Gear Case Oil:		
Type	Hypoid gear oil for LSD (Limited Slip Differential gears)	– – –
Viscosity	SAE 140 (GL-5) or SAE 90 (GL-6)	– – –
Capacity	0.4 L (0.4 US qt)	– – –
Oil Level	Filler opening level	– – –

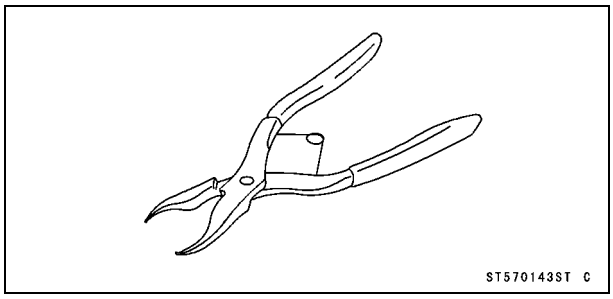
Specifications

Item	Standard	Service Limit
Brakes		
Brake Fluid:		
Type	DOT3	– – –
Fluid Level	Between upper and lower level lines	– – –
Brake Pedal Play	2 ~ 10 mm (0.08 ~ 0.39 in.)	– – –
Brake Drum Inside Diameter	180.000 ~ 180.160 mm	180.75 mm
	(7.0866 ~ 7.0929 in.)	(7.116 in.)
Brake Shoe Lining Thickness	4.5 mm (0.18 in.)	1.0 mm (0.04 in.)
Parking Brake Lever Travel	8 ~ 12 notches (clicks) at 200 N (20 kgf, 44 lb)	– – –
Steering		
Steering Wheel Free Play	0 ~ 20 mm (0 ~ 0.79 in.)	– – –
Electrical System		
Battery:		
Capacity	12 V 52 Ah	– – –
Voltage	12.6 V or more	– – –
Electrolyte Level*	Between upper and lower level	– – –
Specific Gravity*	1.265 at 20°C (68°F)	– – –
Switches:		
Brake Light Switch Timing	ON after 10 mm (0.39 in.) of pedal travel	– – –

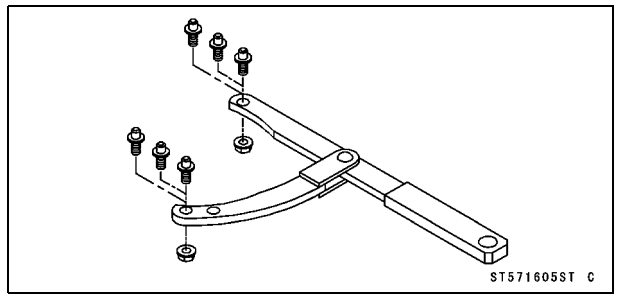
*: Conventional Type Battery

Special Tools

Inside Circlip Pliers:
57001-143



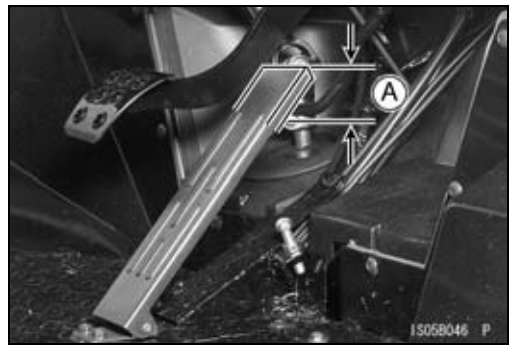
Flywheel & Pulley Holder:
57001-1605



Periodic Maintenance Procedures

Fuel System

Throttle Pedal Play Inspection



- Check that the throttle pedal moves smoothly from full open to close.

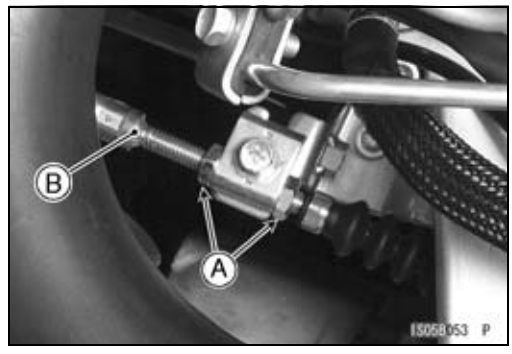
★If the throttle pedal does not return properly, lubricate the throttle cable and link (see Throttle Cable Lubrication in the Fuel System chapter).

- Check the throttle pedal play [A].

Throttle Pedal Play
Standard: 5 ~ 10 mm (0.20 ~ 0.39 in.)

★If the play is incorrect, adjust the throttle cable.

Throttle Pedal Play Adjustment



- Tilt up the cargo bed.
- Loosen the adjuster mounting nuts [A] at the engine end of the cable.
- Slide the adjuster [B] until the proper amount of throttle pedal play is obtained.
- Tighten the adjuster mounting nuts securely.
- Start the engine.
- With the transmission in neutral, operate the throttle pedal a few times to make sure that the idle speed does not change.

★If the idle speed does change, the throttle cable may be improperly adjusted, incorrectly routed, or it may be damaged.

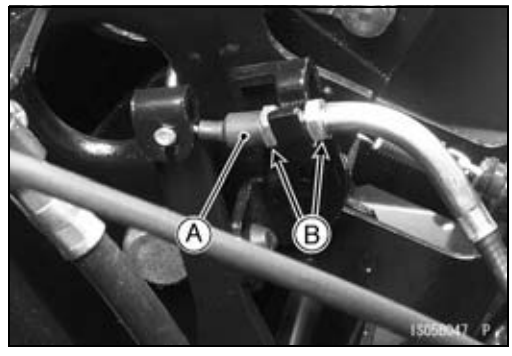
- Correct any of these conditions before operation.

⚠ WARNING

Operation with improperly adjusted, incorrectly routed, or a damaged cable could result in an unsafe operating condition.

NOTE

○*If the throttle pedal play can not be adjusted by using the adjuster at the engine end of the cable, use the cable adjuster [A] at the throttle pedal. Do not forget to securely tighten the adjuster mounting nuts [B].*



Periodic Maintenance Procedures

Idle Speed Inspection

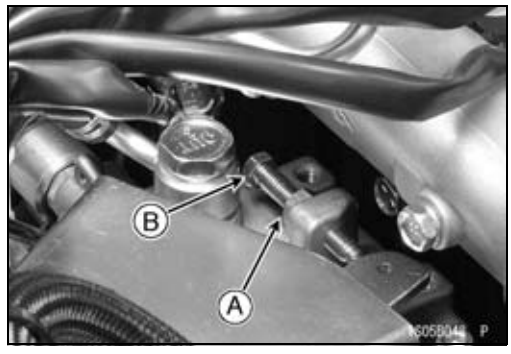


- Start the engine and warm it up thoroughly.
- Tilt up the cargo bed.
- Check the idle speed with a suitable tachometer [A].
  Tachometer Adapter [B]

Idle Speed
Standard: 850 ~ 950 r/min (rpm)

★If the idle speed is out of the specified range, adjust it.

Idle Speed Adjustment

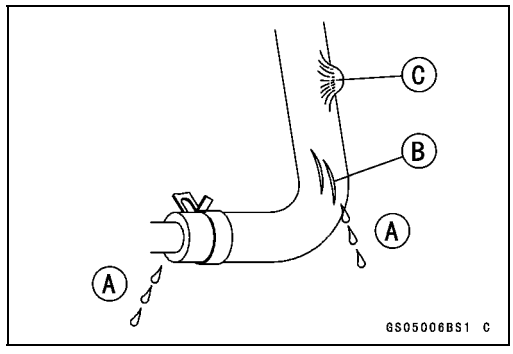


- Start the engine and warm it up thoroughly.
- Loosen the locknut [A].
- Turn the idle adjusting screw [B] at the injection pump until the idle speed is correct.
- Tighten:

Torque - Idle Adjusting Screw Locknut: 6.9 N·m (0.70 kgf·m, 61 in·lb)

- Open and close the throttle a few times to make sure that the idle speed is within the specified range. Readjust if necessary.

Fuel Hoses and Connections Inspection



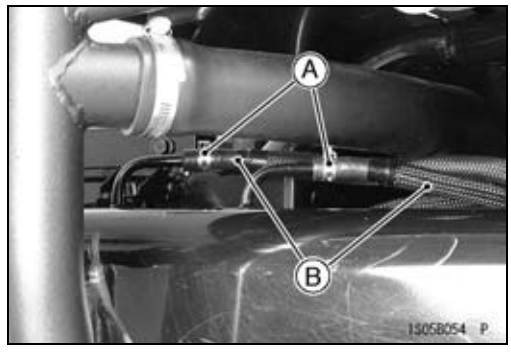
- Tilt up the cargo bed and seat.
- Check the fuel hoses and fittings for deterioration, cracks and signs of leakage.

★Replace the fuel hose if any fraying, leak [A], cracks [B] or bulges [C] are noticed.

- Check that the hoses are securely connected and clamps are installed correctly.
- When installing, run the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- When installing the fuel hoses, avoid sharp bending, kinking, flattening or twisting, and route the fuel hoses with a minimum of bending so that the fuel flow will not be obstructed.

★Replace the hose if it has been sharply bent or kinked.

Fuel Hoses Replacement



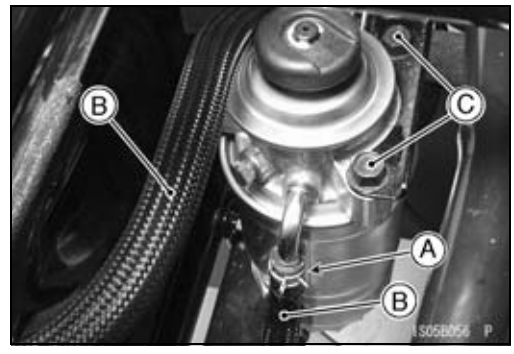
- Tilt up the cargo bed and seat.
- Remove:
  Clamps [A]
  Fuel Hoses [B]

Periodic Maintenance Procedures

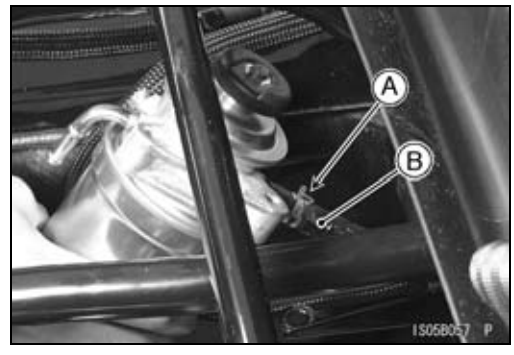
● Remove:
Clamps [A]
Fuel Hoses [B]



● Remove:
Clamp [A]
Fuel Hoses [B]
Fuel Filter Mounting Bolts [C]

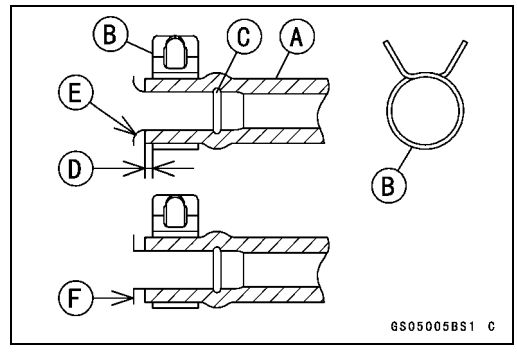


● Remove:
Clamp [A]
Fuel Hose [B]



● When installing, run the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
● When installing the fuel hoses, avoid sharp bending, kinking, flattening or twisting, and run the fuel hoses with a minimum of bending so that the fuel flow will not be obstructed.

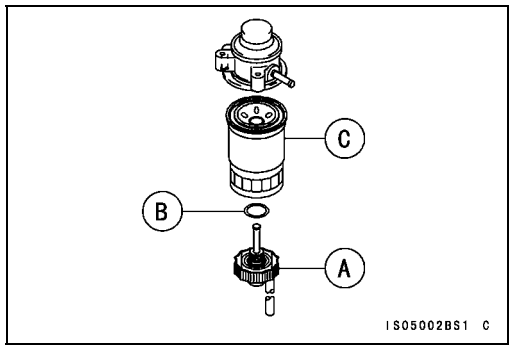
● Fit the fuel hose [A] onto the fitting fully and install the plate clamp [B] beyond the raised rib [C].
1 ~ 2 mm (0.039 ~ 0.079 in.) [D]
○The hose end must reach the filler [E] or be as near as possible to the step [F].



● Bleed the air from the fuel filter (see Fuel Filter Installation in the Fuel System chapter).

Periodic Maintenance Procedures

Fuel Filter Element Replacement

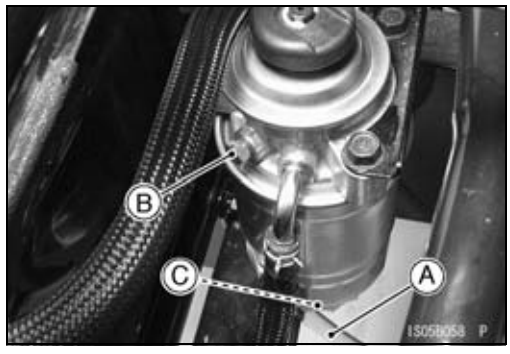


- Remove:
  Fuel Filter (see Fuel Filter Removal in the Fuel System chapter)
  Drain Cap [A]
  O-ring [B]
  Filter Cartridge [C]

○Use a suitable filter wrench.

- Install a new filter cartridge by hand until the gasket contacts the housing. Then tighten it 1/3 turn more.
- Install:
  Drain Cap
  New O-ring
  Fuel Filter (see Fuel Filter Installation in the Fuel System chapter)

Fuel Filter Water Draining



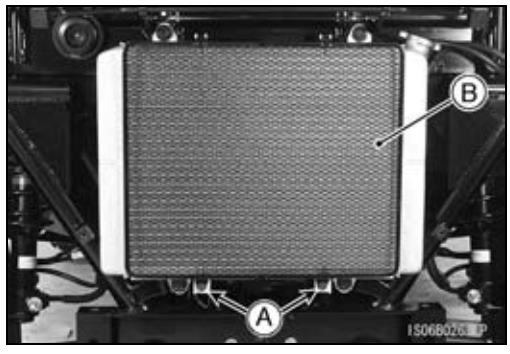
- Tilt up the cargo bed.
- Place a suitable container under the filter drain hose [A].
- Loosen the air vent plug [B].
- Loosen the drain cap [C] approximately 1 turn, and drain water from the filter until only fuel flows from the filter.
- Tighten the drain cap securely.
- Bleed the air from the fuel filter (see Fuel Filter Element Replacement).

○Wipe off any spilled fuel.

- Start the engine, and check for fuel leakage.

Cooling System

Radiator Cleaning



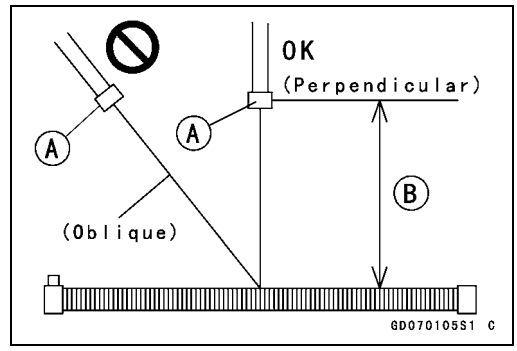
CAUTION
Clean the radiator screen and the radiator in accordance with the Periodic Maintenance Chart. In dusty areas, they should be cleaned more frequently than the recommended interval. After riding through muddy terrain, the radiator screen and the radiator should be cleaned immediately.

- Remove:
  Front Cover (see Front Cover Removal in the Frame chapter)
  Radiator Screen Mounting Bolts [A]
  Radiator Screen [B]
- Clean the radiator screen in a bath of tap water, and then dry it with compressed air or by shaking it.

Periodic Maintenance Procedures

CAUTION

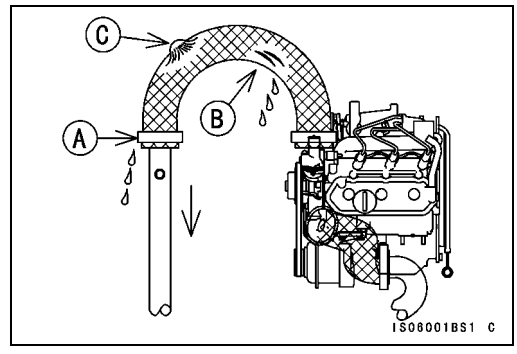
When cleaning the radiator with a steam cleaner, be careful of the following to prevent radiator damage.
Keep the steam gun [A] away more than 0.5 m (1.6 ft) [B] from the radiator core.
Hold the steam gun perpendicular to the core surface.
Run the steam gun following the core fin direction.



- Install the radiator screen.
- Tighten:

Torque - Radiator Screen Mounting Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

Radiator Hose and Connection Inspection



○The high pressure inside the radiator hose can cause coolant to leak [A] or the hose to burst if the line is not properly maintained. Visually inspect the hoses for signs of deterioration. Squeeze the hoses. A hose should not be hard and brittle, nor should it be soft or swollen.

★Replace the hose if any fraying, cracks [B] or bulges [C] are noticed.

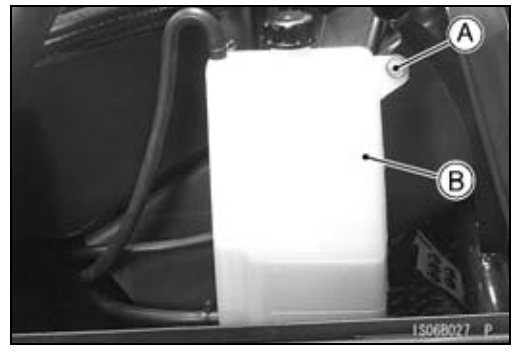
- Check that the hoses are securely connected and clamps are tightened correctly.

Coolant Change

⚠ WARNING

To avoid burns, do not remove the radiator cap or try to change the coolant when the engine is still hot. Wait until it cools down. Coolant on tires will make them slippery and can cause an accident and injury. Immediately wash away any coolant that spills on the frame, engine, or wheels.
Since coolant is harmful to the human body, do not use for drinking.

- Tilt up the cargo hood.
- Remove:
  Coolant Reserve Tank Bolt [A]
  Coolant Reserve Tank [B] (Upward)
- Pour the coolant into a container.



Periodic Maintenance Procedures

- Remove the front final gear case skid plate (see Front Final Gear Case Oil Level Inspection in the Final Drive chapter).
- Place a container under the drain plugs.
- Remove the coolant drain plugs [A] at water pipes.
- Place a funnel under the drain hole.



- Remove the radiator cap [A] in two steps.
  - ○First turn the cap counterclockwise to the first step.
  - ○Then push and turn it further in the same direction and remove the cap.



- Tighten the drain plugs.
- Install the reserve tank hose and reserve tank.
- Tighten:

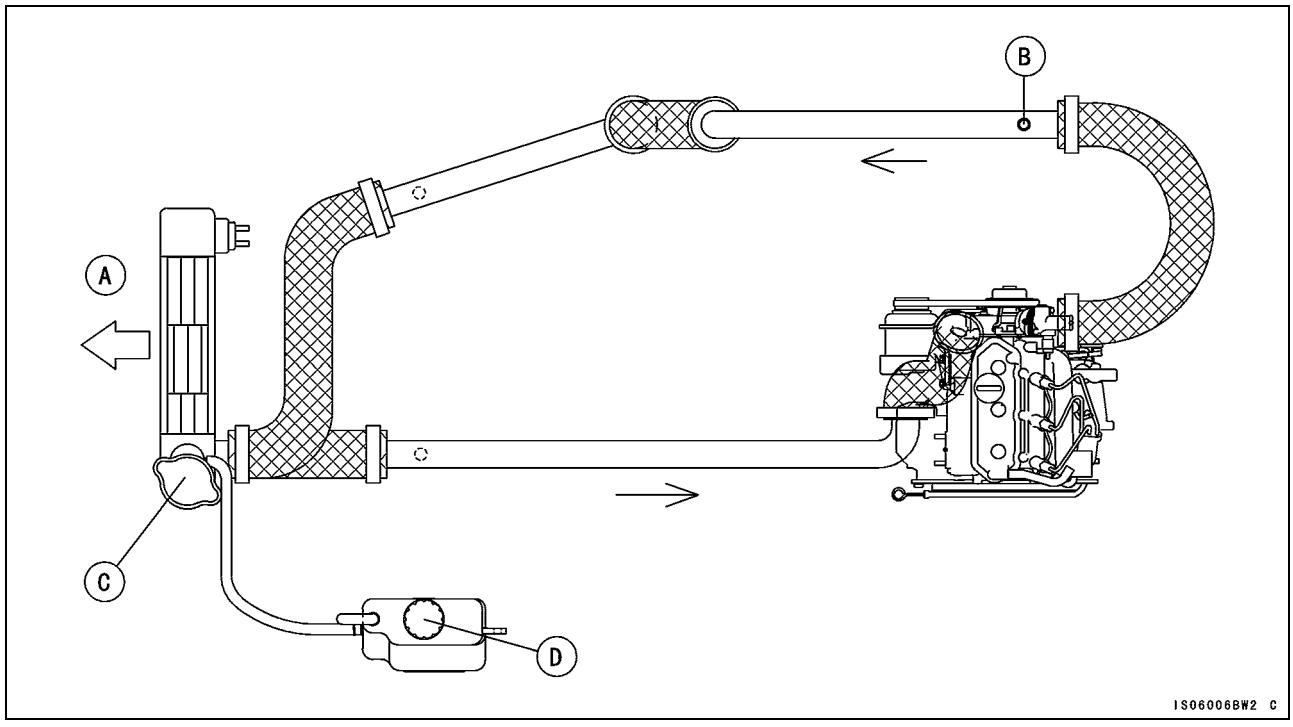
Torque - Coolant Reserve Tank Bolt: 4.4 N·m (0.45 kgf·m, 39 in·lb)

- Lift the front wheels 20 ~ 30 cm (7.9 ~ 11.8 in.) from the ground so that the radiator cap is the highest port of the system.
- Pour the coolant slowly into the radiator cap fitting.

NOTE

○*Pour in the coolant slowly so that the air in the engine and radiator can escape.*

Periodic Maintenance Procedures



Front [A]
Air Bleeder Bolt [B]
Radiator Cap [C]
Reserve Tank Cap [D]

CAUTION

Soft or distilled water must be used with antifreeze in the cooling system.
If hard water is used in the system, it causes scale accumulation in the water passages, considerably reducing the efficiency of the cooling system.

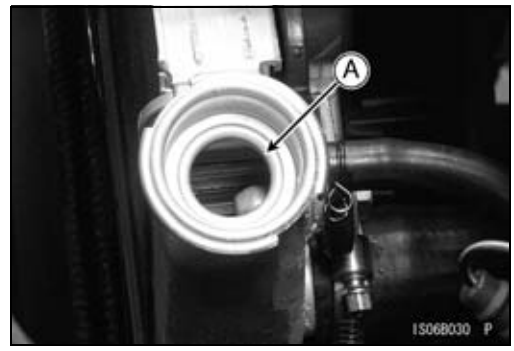
Water and Coolant Mixture Ratio (Recommended)

Soft Water:	**50%**
Coolant:	**50%**
Freezing Point:	**–35°C (–31°F)**
Total Amount:	**4.1 L (4.3 US qt)**

NOTE

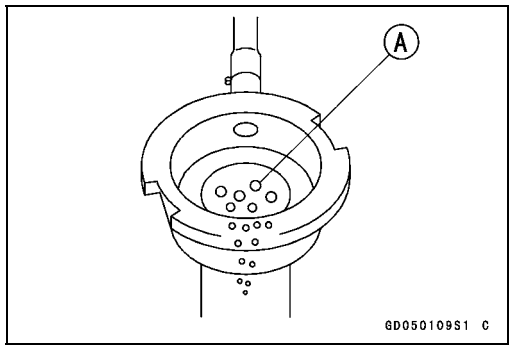
○*Choose a suitable mixture ratio by referring to the coolant manufacturer's directions.*

- When the coolant begins to flow out the air bleeder bolt holes, tighten the air bleeder bolt.
- Fill the cooling system up to the filler neck [A] in the radiator cap fitting with coolant.



Periodic Maintenance Procedures

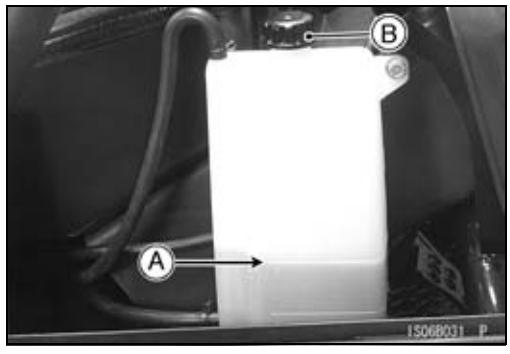
- Bleed the air from the cooling system as follows.
  - Start the engine and run it until no more air bubbles [A] can be seen in the coolant (less than five minutes).
  - Tap the radiator hoses to force any air bubbles caught inside.
  - Stop the engine and add coolant up to the filler neck.
- Install the radiator cap.
- Lower the front wheels slowly.



- Fill the reserve tank up to the F (full) level line [A] with coolant.

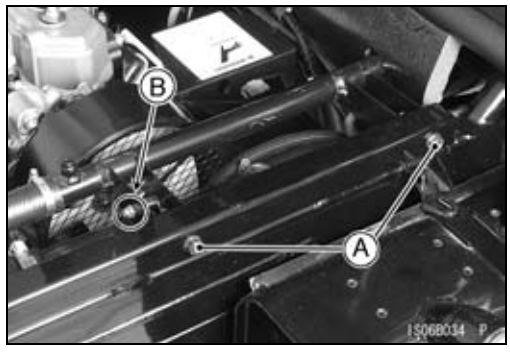
CAUTION
Do not add more coolant above the F (full) level line.

- Install the reserve tank cap [B].



Cooling Fan Belt Inspection

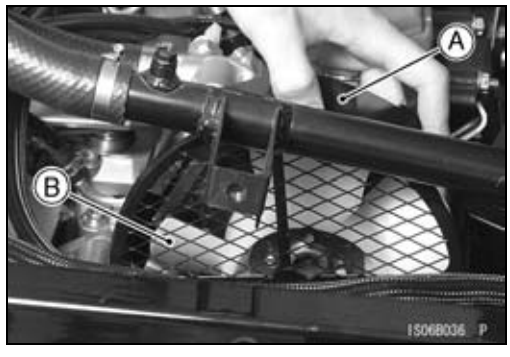
- Tilt up the cargo bed.
- Remove:
  Rear Propeller Shaft (see Propeller Shaft Removal in the Final Drive chapter)
  Water Pipe Mounting Bolts [A]
  Air Duct Mounting Bolt and Nut [B]



- Remove the fan cover bolts [A].



- Take off the fan cover [A].
- Rotate the fan blade [B], and position it as shown in the figure.



Periodic Maintenance Procedures

● Remove the fan cover [A] as shown in the figure.

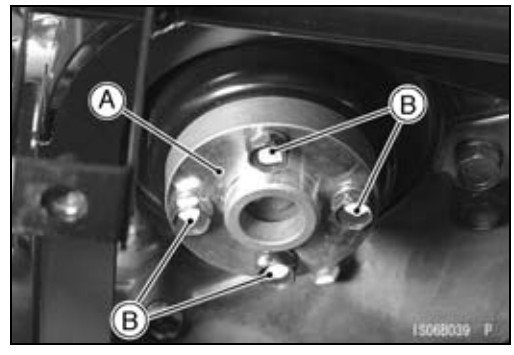


● Remove:
Fan Mounting Bolts [A]
Cooling Fan [B]
Spacer

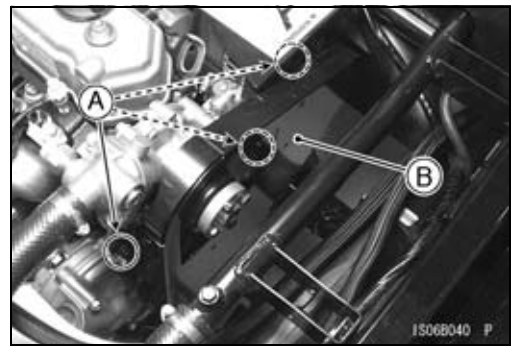


● Reinstall the spacer [A] and tighten the fan mounting bolts [B] temporary.

Torque - Fan Mounting Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

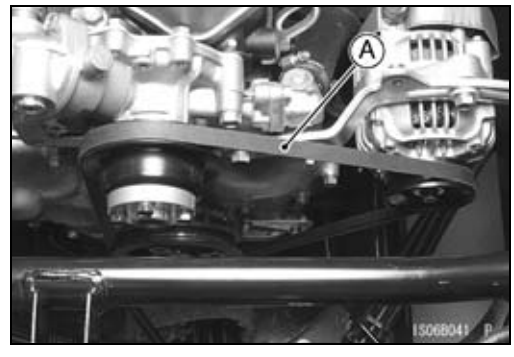


● Remove:
Bolts [A]
Fan Belt Cover [B]



● Check the cooling fan belt [A] for excessive wear crack or broken.

★ If necessary, replace the belt with a new one.

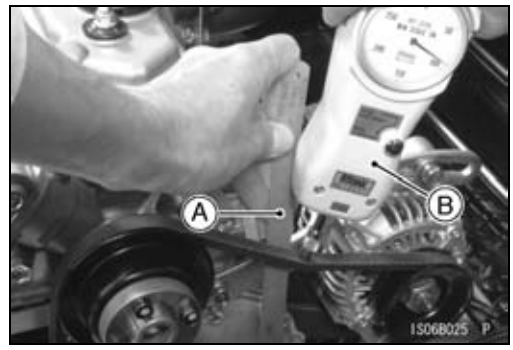


Periodic Maintenance Procedures

● Check the fan belt deflection.
○Use a ruler [A], push the belt with 98 N (10 kgf, 22 lb) force.
Push Gauge [B]

Fan Belt Deflection
Standard: 9.5 ~ 11.5 mm (0.37 ~ 0.45 in.)

★If the deflection is incorrect, adjust it.



● Loosen the alternator adjusting bracket bolt [A] and alternator mounting bolt [B].
Alternator [C]
● Adjust the fan belt deflection.
○Use a ruler, push the belt with 98 N (10 kgf, 22 lb) force.
● Tighten the bolts.

Torque - Alternator Adjusting Bracket Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)
Alternator Mounting Bolt: 39 N·m (4.0 kgf·m, 29 ft·lb)



Engine Top End

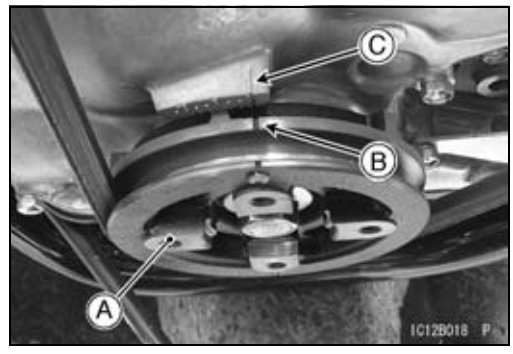
Valve Clearance Inspection

NOTE

○*Valve clearance must be checked when the engine is cold (at room temperature).*

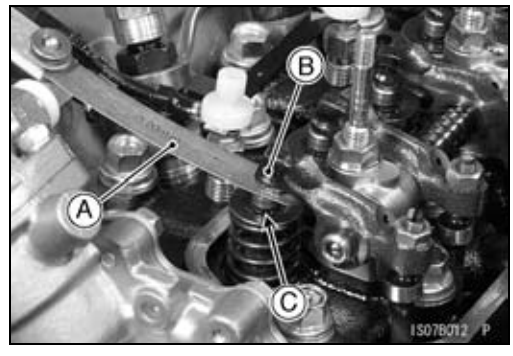
● Remove:
Fan Belt Cover (see Cooling Fan Belt Inspection)
Cylinder Head Cover (see Rocker Arm Components Removal in the Engine Top End chapter)

● Turn the crankshaft pulley [A] clockwise so that the timing mark [B] on the pulley aligns with the reference point [C] on the timing gear case cover.
○Check that the rocker arms at #1 cylinder are free.
★If not, turn the pulley one more turn to free the rocker arms.



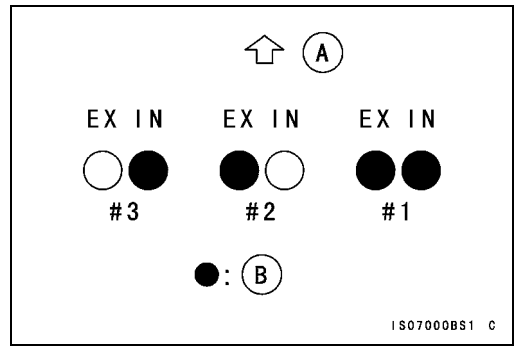
● Using a thickness gauge [A], measure the valve clearance between the rocker arm [B] and the valve stem cap [C].
★If the valve clearance is incorrect, adjust it.

Valve Clearance
Standard: 0.20 mm (0.0079 in.)

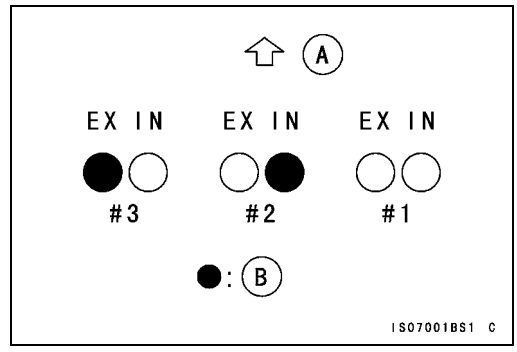


Periodic Maintenance Procedures

○When positioning #1 piston TDC at the compression stroke:
Inlet valve clearance of #1 and #3 cylinders
Exhaust valve clearance of #1 and #2 cylinders
Front [A]
Measuring Valve [B]



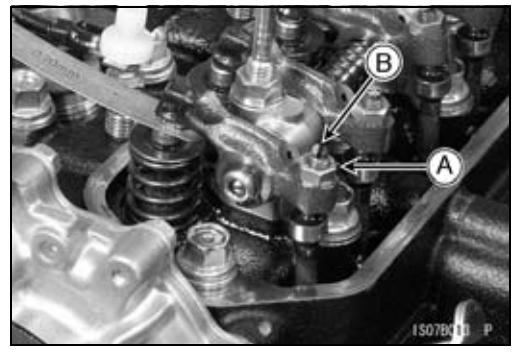
○Turn the crankshaft pulley 360° clockwise.
Inlet valve clearance of #2 cylinder
Exhaust valve clearance of #3 cylinder
Front [A]
Measuring Valve [B]



Valve Clearance Adjustment

- Loosen the valve adjusting screw locknut [A].
- Turn the valve adjusting screw [B] until the correct clearance is obtained.
- Holding the adjusting screw, tighten the locknut.

Torque - Valve Adjusting Screw Locknuts: 11 N·m (1.1 kgf·m, 97 in·lb)



Spark Arrester Cleaning

⚠ WARNING

To avoid burns, wear gloves while cleaning the spark arrester. Since the engine must be run during this procedure, the muffler will become hot.



- Remove the drain plug [A] from the muffler [B].
- Apply the parking brake.
- In an open area away from combustible materials, start the engine with the gear shift lever in the N (neutral) position.
- Raise and lower engine speed while tapping on the muffler with a rubber mallet until the carbon particles are purged from the muffler.

⚠ WARNING

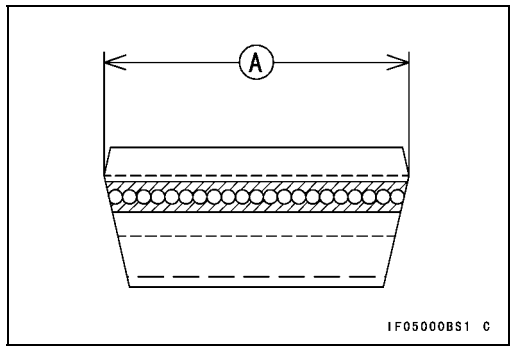
Do not run the engine in a closed area. Exhaust gases contain carbon monoxide; a colorless, odorless, poisonous gas. Breathing exhaust gas can lead to carbon monoxide poisoning, asphyxiation, and death.

- Stop the engine.
- Install the drain plug.

Periodic Maintenance Procedures

Converter System

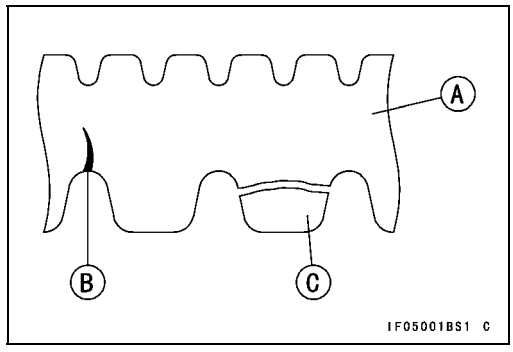
Drive Belt Inspection



- Remove the drive belt (see Drive Belt Removal in the Converter System chapter).
- Measure the width [A] of the belt.

★If any measurements exceed the service limit, replace the belt.

Belt Width
Standard: 34.1 mm (1.34 in.)
Service Limit: 32.6 mm (1.28 in.)



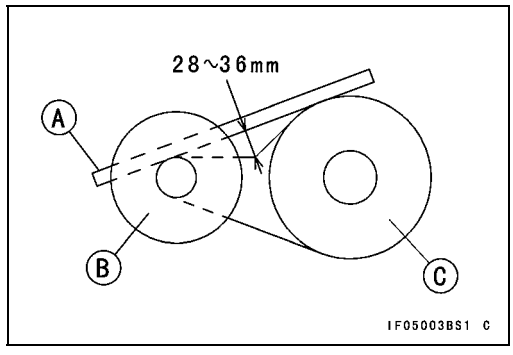
- Check the belt for wear, cracks, breaks or peeling.

★If necessary, replace the belt with a new one.
Belt [A]
Crack [B]
Broken [C]

NOTE

○*Whenever the belt is replaced, inspect the drive and the driven pulleys.*

Drive Belt Deflection Inspection



- Remove the torque converter inner cover (see Torque Converter Inner Cover Removal in the Converter System chapter).
- Put the transmission in neutral and rotate the driven pulley by hand to make sure the belt is shifted all the way to the top of the driven pulley.
- Measure the belt deflection as shown in the figure.

○Place a straightedge [A] on top of the belt between the drive pulley [B] and the driven pulley [C].
○Use a ruler to push the belt away from the straightedge. Push hard, but with no more force than 59 N (6 kgf, 13 lb).

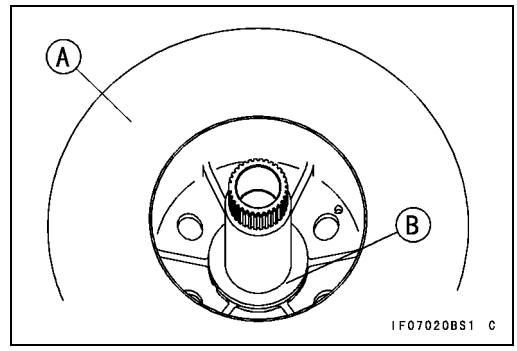
Belt Deflection
Standard: 28 ~ 36 mm (1.10 ~ 1.42 in.)

★If the belt deflection is not within the specified range, first measure the drive belt width (see Drive Belt Inspection). Adjust the deflection by adding or removing spacers between the driven pulley shaft hub and cam ramp.

- When adjusting the deflection, less is better than more. Less deflection will maintain better performance for more time as the belt width decreases by normal wear, which causes the deflection to increase with usage.

Periodic Maintenance Procedures

Drive Belt Deflection Adjustment



- Disassemble the driven pulley [A] (see Driven Pulley Disassembly in the Converter System chapter).

★If the belt deflection is more than 36 mm (1.42 in.), remove the spacers to decrease it.

○The rule-of-thumb is: 0.1 mm (0.004 in.) change in spacer thickness equals about 1.4 mm (0.055 in.) change in belt deflection.

★If the belt deflection is less than 28 mm (1.10 in.), add the spacers [B] to increase it.

○The rule-of-thumb is: 0.1 mm (0.004 in.) change in spacer thickness equals about 1.6 mm (0.063 in.) change in belt deflection.

Spacers

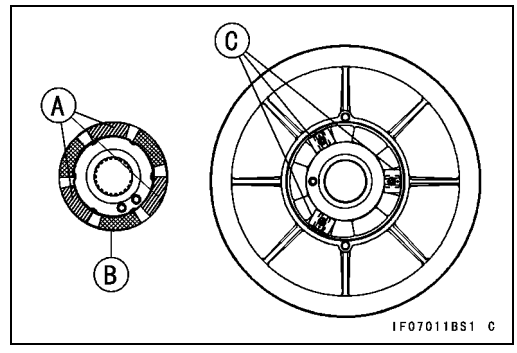
Thickness	Part No.
0.3 mm (0.012 in.)	92026-0036
0.6 mm (0.024 in.)	92026-1626
0.8 mm (0.031 in.)	92026-1628
1.0 mm (0.039 in.)	92026-1625
1.4 mm (0.055 in.)	92026-1627

- Assemble the driven pulley (see Driven Pulley Assembly in the Converter System chapter).
- With the transmission in neutral, rotate the driven pulley to allow the belt to return to the top of the sheaves before measuring the belt deflection.
- Measure the belt deflection again and repeat the above procedures until it is within the standard range.
- Using the flywheel & pulley holder, apply a non-permanent locking agent to the driven pulley bolt and tighten it.

Special Tool - Flywheel & Pulley Holder: 57001-1605

Torque - Driven Pulley Bolt: 93 N·m (9.5 kgf·m, 69 ft·lb)

Converter Driven Pulley Shoe Inspection



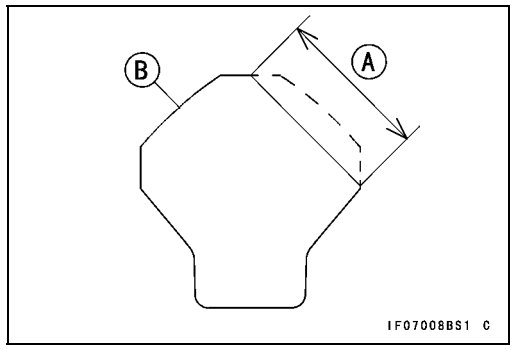
- Disassemble the driven pulley (see Driven Pulley Disassembly in the Converter System chapter).

★If the cams [A] of ramp [B] or the wear shoes [C] are damaged or worn, replace the ramp or the wear shoes.

Periodic Maintenance Procedures

★If the wear shoe contact area width [A] is greater than the service limit, replace the shoe [B].

Wear Shoe Width
Service Limit: 16.4 mm (0.65 in.)



Converter Air Cleaner Element Cleaning/Inspection

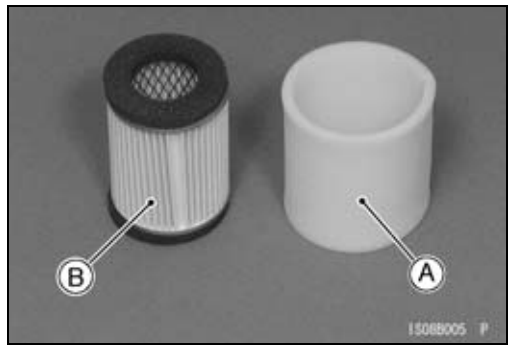
NOTE

○*In dusty areas, the element should be cleaned more frequently than the recommended interval.*
○*After riding through rain or on muddy roads, the element should be cleaned immediately.*

⚠ WARNING

Clean the element in a well-ventilated area, and take ample care that there are no sparks or flame anywhere near the working area.
Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvent to clean element.

- Remove the air cleaner element (see Air Cleaner Element Removal in the Converter System chapter).
- Separate the foam element [A] from the paper element [B].
- Clean the foam element in a bath of a high-flash point solvent, and then dry it with compressed air or by shaking it.
- After cleaning, saturate the foam element with SE class SAE30 oil, squeeze out the excess, then wrap it in a clean rag and squeeze it as dry as possible. Be careful not to tear the foam element.
- Clean the paper element by tapping gently.



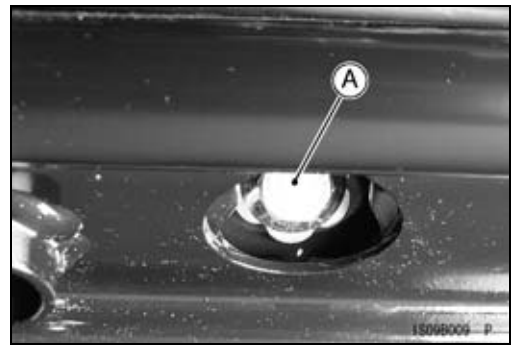
CAUTION

Do not use compressed air to clean the paper element.
Do not oil the paper element.

Periodic Maintenance Procedures

Engine Lubrication System

Engine Oil and/or Oil Filter Change



- Warm up the engine so that the oil will pick up any sediment and drain easily.
- Place an oil pan beneath the engine.
- Remove the engine oil drain plug [A], and let the oil drain completely.

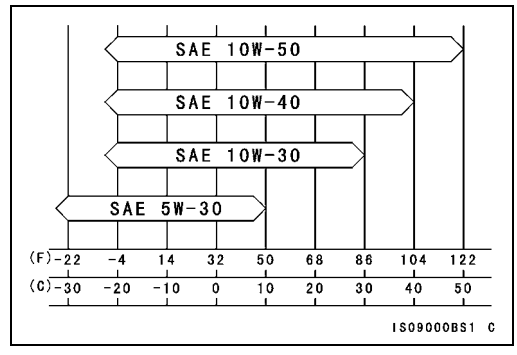
★If the oil filter is to be changed, replace it with a new one (see Oil Filter Removal/Installation).

- Replace the gasket with a new one.
- After the oil has completely drained out, install the drain plug with the gasket.

Torque - Engine Oil Drain Plugs: 34 N·m (3.5 kgf·m, 25 ft·lb)

CAUTION

To avoid engine damage, do not fill the engine oil above the full level. If the oil level in the cylinder head cover gets too high because of filling too fast, oil may over flow from the filler opening and/or may flow through the crankcase breather hose into the inlet manifold. Oil in the inlet manifold may flow into the combustion chambers and cause hydraulic lock, resulting in severe engine damage.



- Remove the oil filler cap, and pull the dipstick out a little (about 5 cm, 2 in.) to allow the air in the crankcase to escape.
- Slowly and evenly fill the engine with a good quality oil as specified in the table.
- Check the oil level.

Engine Oil

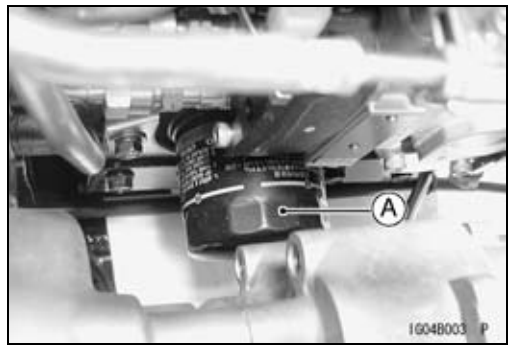
Grade:	**API CF or CF-4**
Viscosity:	**SAE 10W-40**
Capacity:	**3.0 L (3.2 US qt)**
	(When filter is not removed)
	3.3 L (3.5 US qt)
	(When filter is removed)
Oil Level:	**Between F and L marks on dipstick**

NOTE

○*Although 10W-40 engine oil is the recommended oil for most conditions, the oil viscosity may need to be changed to accommodate atmospheric conditions in your riding area.*

Periodic Maintenance Procedures

Oil Filter Removal



- Tilt up the cargo bed.
- Remove the oil filter [A] from under the vehicle.

○When unscrewing the oil filter, cover the filter bottom with a clean cloth so as not to spill the engine oil out of the filter. Any spilled oil should be wiped up completely.

Oil Filter Installation

- Apply engine oil to the oil filter gasket.
- Install a new filter.

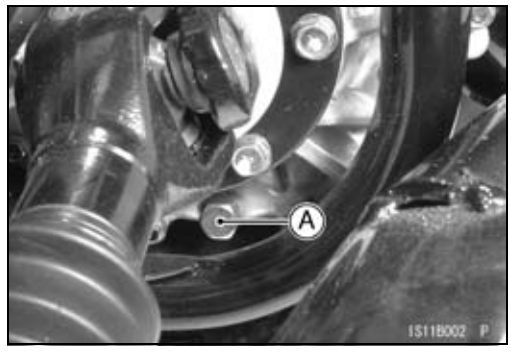
○Screw the filter in until the gasket touches the engine, then turn it 1 turn.

- Add the engine oil (see Engine Oil and/or Oil Filter Change).
- Thoroughly warm up the engine, and check for oil leakage and the oil level.

★If necessary, add more engine oil.

Transmission

Transmission Oil Change



- Warm up the oil by running the vehicle so that the oil will pick up any sediment and drain easily. Then stop the vehicle.
- Place an oil pan beneath the transmission case.
- Remove the transmission oil drain plug [A], and let the oil drain completely.
- Replace the gasket with a new one.
- After the oil has completely drained out, install the drain plug with the gasket.

Torque - Transmission Oil Drain Plug: 15 N·m (1.5 kgf·m, 11 ft·lb)

- Fill the transmission case with a good quality oil as specified in the table.
- Check the oil level.

Transmission Oil

Type:	**Hypoid gear oil**
Viscosity:	**SAE 90: above 5°C (41°F) or**
	SAE 80: below 5°C (41°F)
Capacity:	**2.5 L (2.6 US qt)**
Oil Level:	**Between H and L level lines on dipstick**

Periodic Maintenance Procedures

Wheels/Tires

Wheels Nuts Tightness Inspection



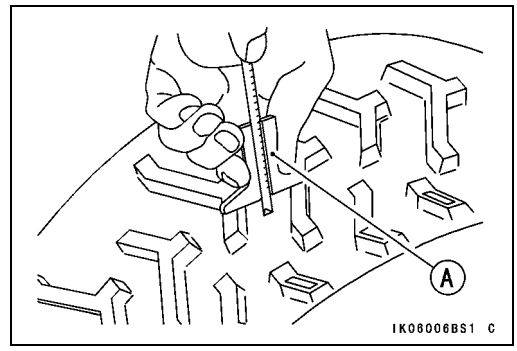
- Check the tightness of all the wheel nuts.

★If there are loose nut, first loosen by 1/2 turn, then re-torque them to the specified torque.

Torque - Wheel Nuts: 137 N·m (14.0 kgf·m, 101 ft·lb)

○Tighten the wheel nuts [1] ~ [4] in a criss-cross pattern.

Tire Wear Inspection



- Examine the tire for damage and wear.

★If the tire is cut or cracked, replace it.

○Lumps or high spots on the tread or sidewalls indicate internal damage, requiring tire replacement.

○Remove any foreign objects from the tread. After removal, check for leaks with a soap and water solution.

- Measure the tread depth at the center of the tread with a depth gauge [A]. Since the tire may wear unevenly, take measurements at several places.

★If any of the measurements is less than the service limit, replace the tire.

Tire Tread Depth

Standard: 13.2 mm (0.52 in.)

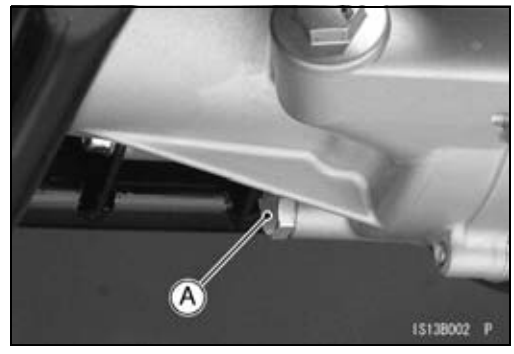
Service Limit 3 mm (0.12 in.)

Standard Tire

Front and Rear: 23 × 11.00-10 DUNLOP KT869 Tubeless

Final Drive

Front Final Gear Case Oil Change



- Warm up the oil by running the vehicle so that the oil will pick up any sediment and drain easily. Then stop the vehicle.
- Park the vehicle so that it is level, both side-to-side and front-to-rear.
- Remove the front final gear case skid plate (see Front Final Gear Case Oil Level Inspection in the Final Drive chapter).
- Place an oil pan beneath the front final gear case and remove the drain plug [A].

⚠ WARNING

When draining or filling the final gear case, be careful that no oil gets on the tire or rim. Clean off any oil that inadvertently gets on them with a high-flash point solvent.

Periodic Maintenance Procedures

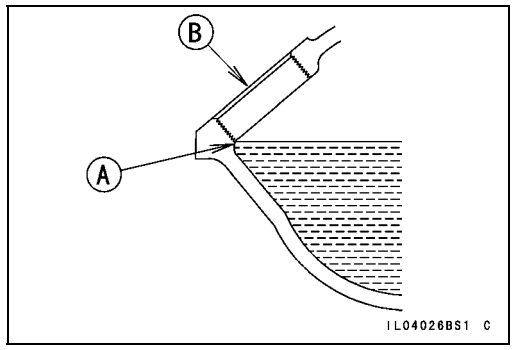
● After the oil has completely drained out, install the drain plug with a new aluminum gasket, and tighten it.

Torque - Oil Drain Plug: 20 N·m (2.0 kgf·m, 15 ft·lb)

● Fill the gear case up to the bottom [A] of filler opening [B] with the oil specified below.

Front Final Gear Case Oil

Type:	**Hypoid gear oil for LSD (Limited Slip Differential gears)**
Viscosity:	**SAE 140 (GL-5) or SAE 90 (GL-6)**
Capacity:	**0.4 L (0.4 US qt)**
Oil Level:	**Filler opening level**

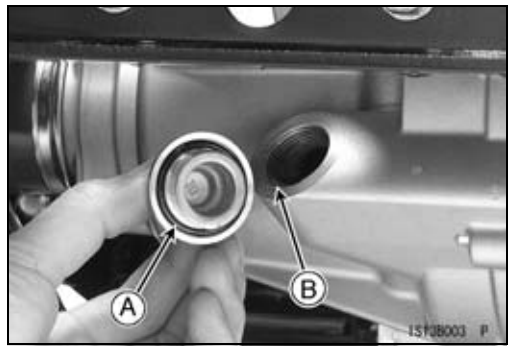


NOTE

○*"GL-5 or GL-6" indicate a quality and additive rating.*

● Be sure the O-ring [A] is in place, and tighten the filler cap.
Filler Opening [B]

Torque - Oil Filler Cap: 29 N·m (3.0 kgf·m, 21 ft·lb)



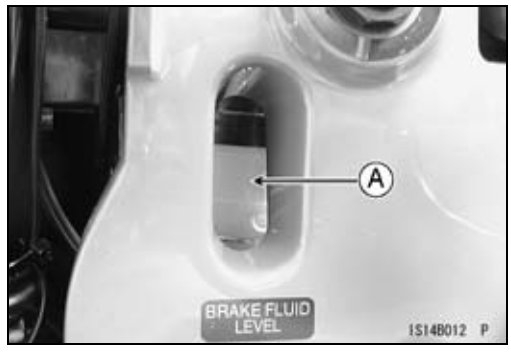
Brakes

Brake Fluid Level Inspection

● With the vehicle on level ground, check that the fluid level in the reservoir is between the upper (MAX) and lower (MIN) level lines.

○Look the fluid level through the hole [A] in the control panel.

★If the fluid level is lower than the lower level line, check for fluid leaks in the brake lines, and fill the reservoir to the upper level line.

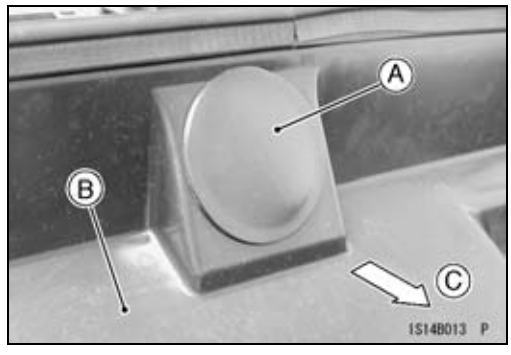


⚠ WARNING

Change the fluid in the brake system completely if the fluid level is low but the type and brand of the fluid already in the reservoir are unknown.

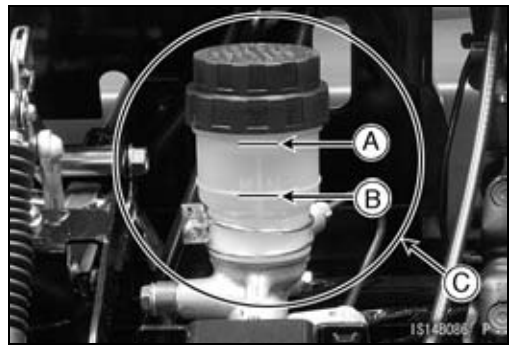
● Tilt up the front cargo hood.

● Remove:
Rubber Cap [A]
Front Cargo Compartment [B]
Front [C]



Periodic Maintenance Procedures

- Fill the reservoir to the upper level line [A].
  Upper Level Line (MAX)
  Lower Level Line (MIN) [B]
  Hole [C] of Front Cargo Compartment
- Apply the brake forcefully for a few seconds and check for fluid leakage around the fittings.

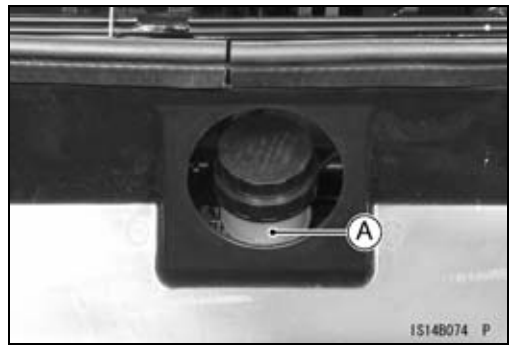


⚠ WARNING

If the brake pedal has a soft or "spongy feeling" when it is applied, there might be air in the brake lines or the brake may be defective. Since it is dangerous to operate the vehicle under such conditions, have the brake system serviced immediately.

Brake Fluid Change

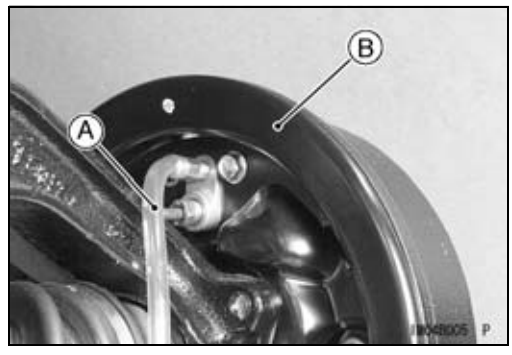
- Tilt up the front cargo hood.
- Level the brake fluid reservoir [A].



NOTE

○*The fluid level must be checked several times during the fluid changing and replenished as necessary. If the fluid in the reservoir runs completely out any time during fluid changing, air bleeding must be done since air will have entered the line.*

- Remove the wheel for extra clearance (see Wheel Removal in the Wheels/Tires chapter).
- Remove the reservoir cap.
- Remove the rubber cap from the bleed valve on the wheel cylinder.
- Connect a clear plastic hose [A] to the bleed valve at the wheel cylinder, running the other end of the hose into a container.
  Left Front Brake Panel [B]



NOTE

○*Start with the rear left or right wheel and finish with the front left or right wheel.*

Periodic Maintenance Procedures

- Fill the reservoir with new brake fluid.
- Temporarily install the reservoir cap.
- Change the brake fluid as follows.

1. Open bleed valve.
2. Pump brake pedal and hold it.
3. Close bleed valve.
4. Release brake pedal.

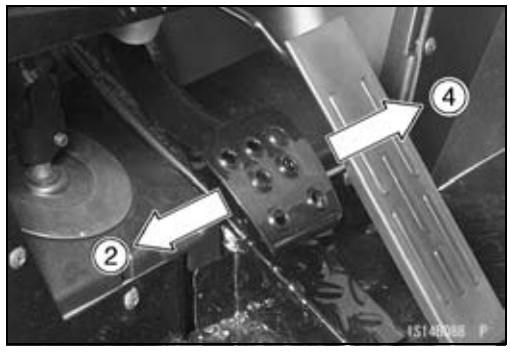
- Tighten:

Torque - Bleed Valves: 5.4 N·m (0.55 kgf·m, 48 in·lb)

- Repeat the previous step for each wheel.
- When brake fluid changing is finished, add the fluid to the upper level in the reservoir.
- After changing the fluid, check the brake for good braking power, no brake drag, and no fluid leakage.

★If necessary, bleed the air from the brake lines (see Brake Line Air Bleeding in the Brakes chapter).





⚠ WARNING

If the brake pedal has a soft or "spongy feeling" when it is applied, there might be air in the brake line or the brake may be defective. Since it is dangerous to operate the vehicle under such conditions, bleed the air from the brake line immediately.

- Install the removed parts (see appropriate chapters).

Brake Pedal Play Inspection

- Check the brake pedal play [A].

Brake Pedal Play
Standard: 2 ~ 10 mm (0.08 ~ 0.39 in.)

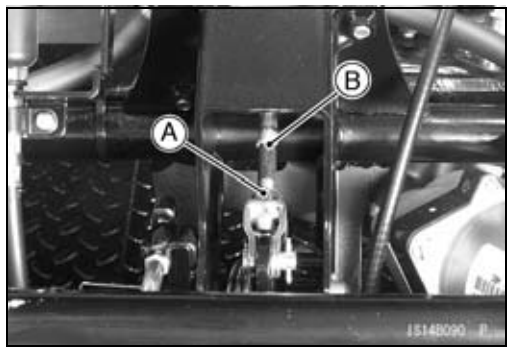
★If the play is not correct, adjust it.



- Remove the front cargo compartment (see Front Cargo Compartment Removal in the Frame chapter).
- Loosen the locknut [A] and turn the push rod [B] to obtain the correct amount of free play.
- Tighten:

Torque - Push Rod Locknut: 17.2 N·m (1.8 kgf·m, 13 ft·lb)

- Check the brake for good braking power and no brake drag.

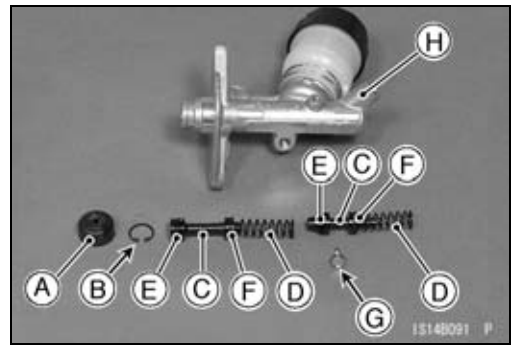


⚠ WARNING

Incorrect adjustment with insufficient free play can cause brake heating and drag. Skidding and loss of control may result.

Periodic Maintenance Procedures

Brake Master Cylinder Cup and Dust Seal Replacement

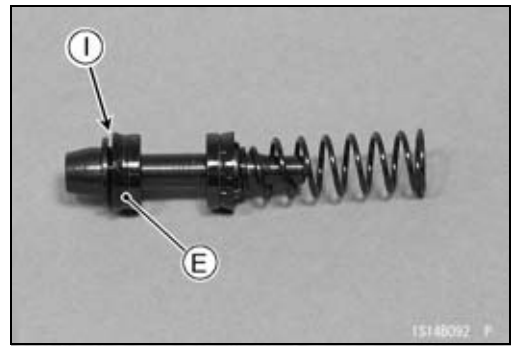


- Remove the master cylinder (see Master Cylinder Removal in the Brakes chapter).
- Remove the piston stop bolt [G].
- Remove the dust seal [A] and then the retainer [B] with the circlip pliers.

Special Tool - Inside Circlip Pliers: 57001-143

○Remove the piston assembly (two pistons) by lightly tap the master cylinder on a wooden block.
Pistons [C]
Springs [D]
Secondary Cups [E]
Primary Cups [F]
Master Cylinder [H]

○Be careful of the secondary cup direction [I].



- Assemble the master cylinder.

○Clean all the parts including the master cylinder with brake fluid or alcohol, and apply brake fluid to the removed parts and the inner wall of the cylinder.

CAUTION

Use only brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning brake parts. Do not use any other fluid for cleaning these parts. Gasoline, motor oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely, and will eventually deteriorate the rubber used in the brake.

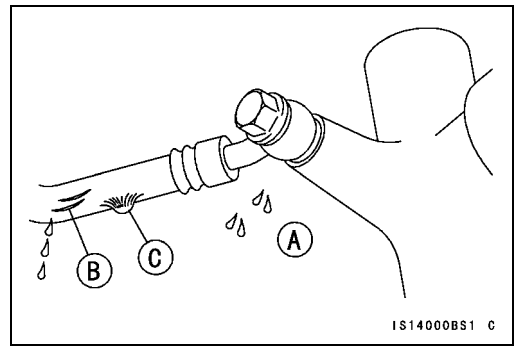
○Push the piston assembly in all the way with a screwdriver and install the piston stop bolt. Use a new aluminum washer.

○Tighten:

Torque - Piston Stop Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)
Reservoir Clamp Bolt: 6.1 N·m (0.62 kgf·m, 54 in·lb)

- Install the master cylinder (see Master Cylinder Installation in the Brakes chapter).

Brake Hose and Pipe Inspection



- The high pressure inside the brake line can cause fluid to leak [A] or the hose to burst if the line is not properly maintained. Bend and twist the rubber hose while examining it.

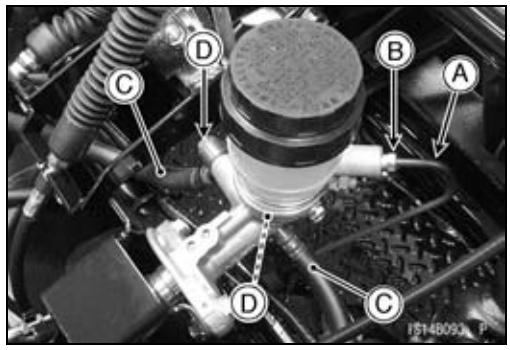
★Replace it if any cracks [B] or bulges [C] are noticed.

- The metal pipe will rust if the plating is damaged.

★Replace the pipe if it is rusted, cracked (especially check the fittings), or if the plating is badly scratched (see Brake Hose and Pipe Replacement).

Periodic Maintenance Procedures

Brake Hose and Pipe Replacement



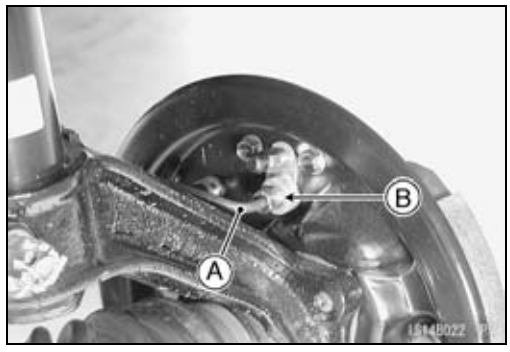
- To remove the brake pipe [A], unscrew the nipple [B].
- To remove the hoses [C], remove the banjo bolts [D] and/or pull out the retainers.

○The front cargo compartment inside is shown.

- Immediately wipe up any brake fluid that spills.

CAUTION

Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.

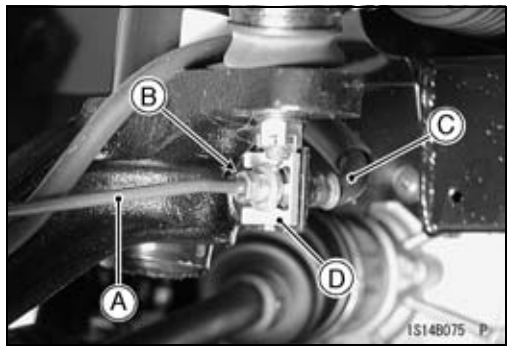


- Use a new copper washer for each side of the hose fittings at the master cylinder.
- Apply brake fluid to the threads of the nipple [B] of the brake pipe [A].
- Tighten:

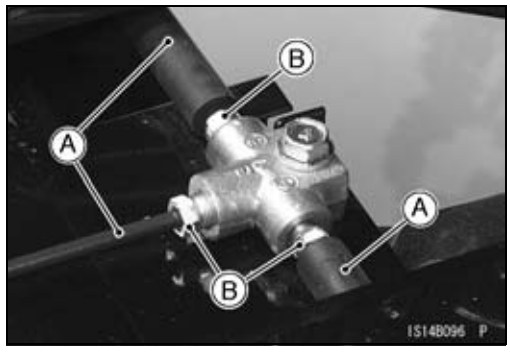
Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Brake Pipe Nipples: 18 N·m (1.8 kgf·m, 13 ft·lb)

- Check that the brake line has proper fluid pressure and no fluid leakage.

○The left front brake drum is shown.



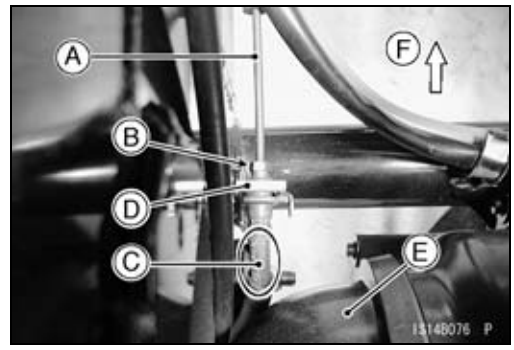
○The left front knuckle is shown.
Brake Pipe [A]
Nipple [B]
Brake Hose [C]
Retainer [D]



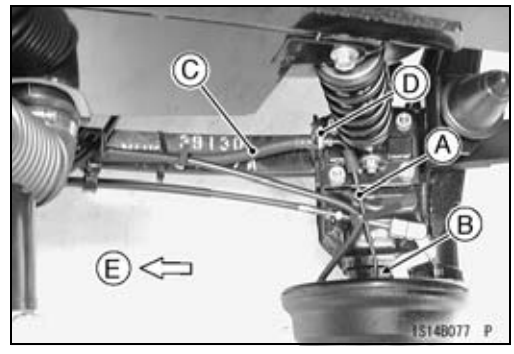
○Left View with Center Floor Panel removed
Brake Hose and Pipes [A]
Nipples [B]

Periodic Maintenance Procedures

○The middle-left of the vehicle is shown with the cargo bed tilted up.
Brake Pipe [A]
Nipple [B]
Brake Hose [C]
Retainer [D]
Torque Converter Outer Cover [E]
Front [F]



○The rear-left brake line is shown.
Brake Pipe [A]
Nipple [B]
Brake Hose [C]
Retainer [D]
Front [E]

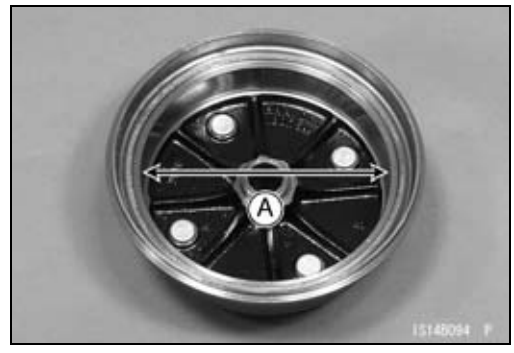


Brake Wear Inspection

- Remove the brake drum (see Brake Drum Removal in the Brakes chapter).
- Measure the inside diameter [A] of the drum at several points.

★If any measurement is greater than the service limit, replace the drum.

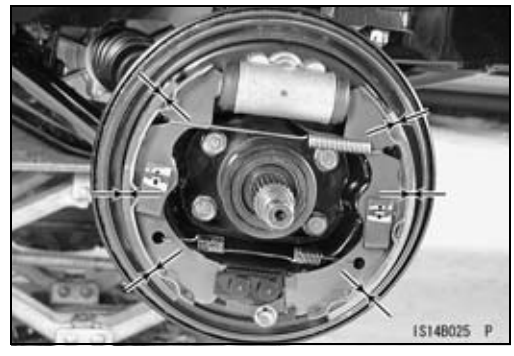
★If the drum is worn unevenly or scored, lightly turn the drum on a brake drum lathe or replace it. Do not turn the drum beyond the service limit.



Brake Drum Inside Diameter
Standard: 180.000 ~ 180.160 mm (7.0866 ~ 7.0929 in.)
Service Limit: 180.75 mm (7.116 in.)

- Remove the brake drum for brake shoe inspection (see Brake Drum Removal in the Brakes chapter).
- Measure the lining thickness at several points.

Brake Shoe Lining Thickness
Standard: 4.5 mm (0.18 in.)
Service Limit: 1.0 mm (0.04 in.)



★If any measurement is less than the service limit, replace both shoes as a set.

★If the lining thickness is greater than the service limit, do the following before installing the shoes.

- File or sand down any high spots on the surface on the lining.
- Use a wire brush to remove any foreign particles from the lining.
- Wash off any oil or grease with an oilless solvent.

CAUTION
Do not use a solvent which will leave an oily residue. The shoes will have to be replaced.

Periodic Maintenance Procedures

Brake Wheel Cylinder Assembly Replacement

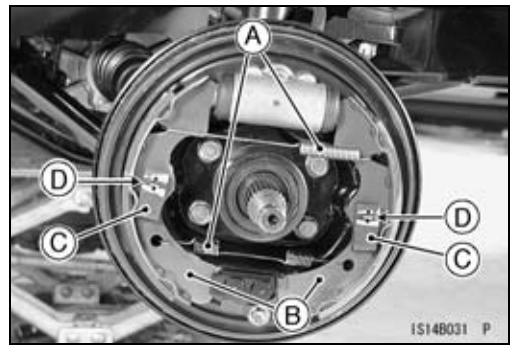
(Front Brake Panel)

- Remove the brake drum (see Brake Drum Removal in the Brakes chapter).

○The left front brake panel is shown.

- Remove the brake shoe springs [A] and brake shoes [B] individually.

○Push the shoe hold-down springs [C] and twist the pins [D] to remove the shoes.



NOTE

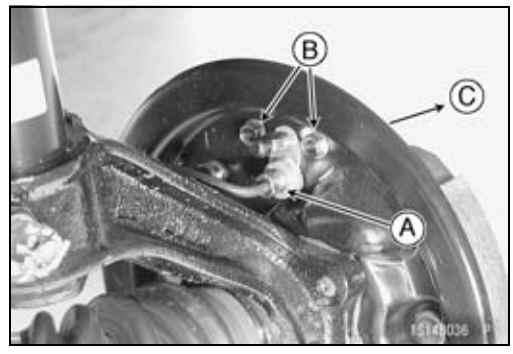
○*Wrap the brake shoes with a clean cloth to protect the linings from grease or dirt.*

- Remove the brake pipe nipple [A] and plug the nipple.

○Immediately wipe up any brake fluid that spills.

CAUTION

Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.

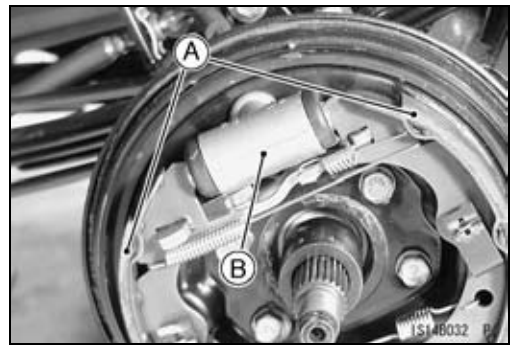


- Unscrew the mounting bolts [B] and take off [C] the front brake wheel cylinder.

(Rear Brake Panel)

- Remove the brake shoes [A] in the same way as in the front brake panel.

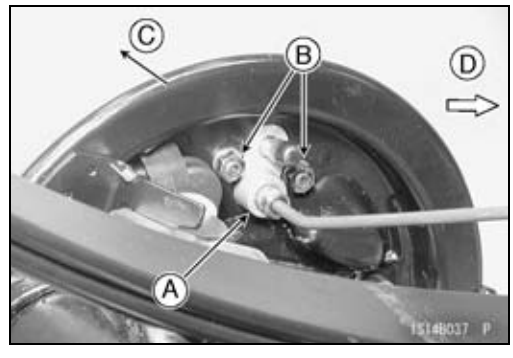
Rear Brake Wheel Cylinder [B]



(Rear Brake Panel)

- Remove the brake pipe nipple [A] and plug the nipple.
- Unscrew the mounting nuts [B] and take off [C] the rear brake wheel cylinder.

Front [D]

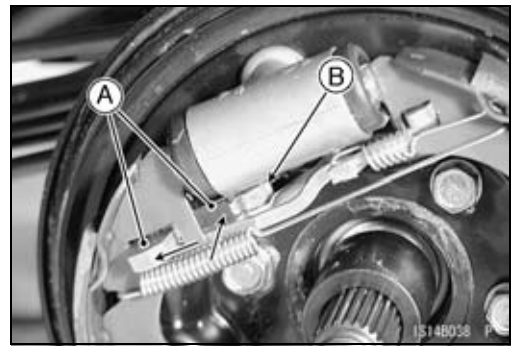


Periodic Maintenance Procedures

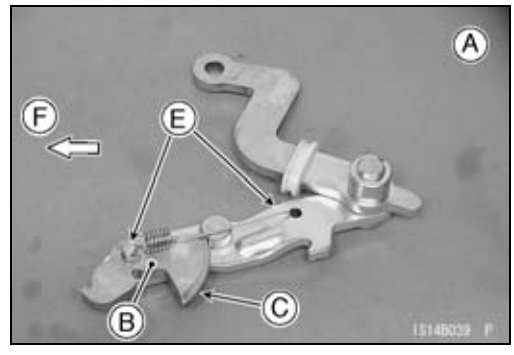
● Replace the rear wheel cylinder with a new one.
● Set the brake shoe clearance adjuster so that the drum can be reinstalled on the panel assembly.
(Front Brake Panel)
○Turn [A] either end of the cylinder fully while holding the other end [B]. Both ends are put into the cylinder.



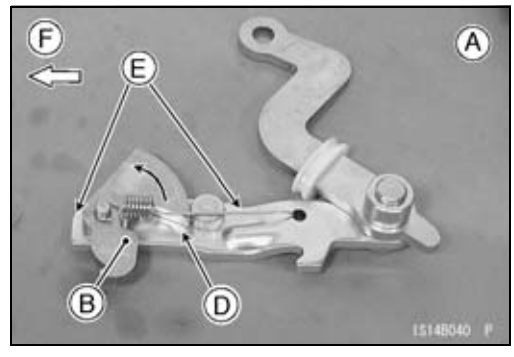
(Rear Brake Panel)
○Push the ratchet [A] forwards and in to reset the shoe clearance adjuster from the protruding position to its original position. The stop [B] sets the position.



Left Parking Brake Lever Linkage [A] of Rear Brake
Ratchet [B]
Protruding Position [C]
Shoe Clearance Adjuster [E]
Front [F]



Left Parking Brake Lever Linkage [A] of Rear Brake
Ratchet [B]
Original Position [D]
Shoe Clearance Adjuster [E]
Front [F]

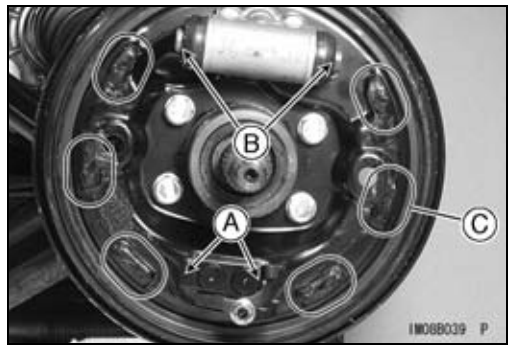


● Apply brake fluid to the threads of the brake pipe nipple and tighten it.

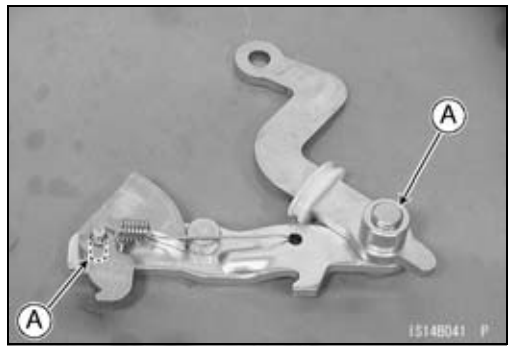
Torque - Brake Pipe Nipples: 18 N·m (1.8 kgf·m, 13 ft·lb)
Front Wheel Cylinder Mounting Bolts: 10.3 N·m (1.1 kgf·m, 91 in·lb)
Rear Wheel Cylinder Mounting Nuts: 7.4 N·m (0.75 kgf·m, 65 in·lb)

Periodic Maintenance Procedures

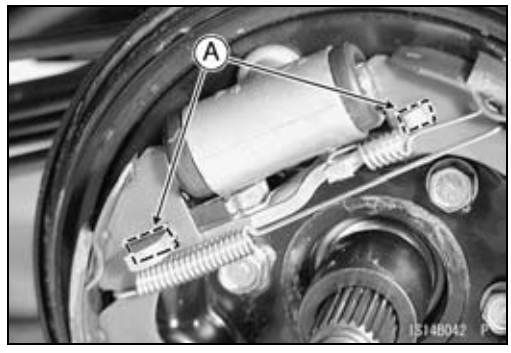
● Apply grease to the following portions (front and rear brake panels).
Brake Panel and Brake Shoe Contact Points [A]
Wheel Cylinder Piston Ends [B]
Brake Shoe Anchor Ends [C]
○The left front brake is shown.



(Rear Brake Panel)
● Grease the shoe clearance adjuster pivots [A].



(Rear Brake Panel)
● Pack the gaps [A] with a little grease.
(Front and Rear Brake Panels)
● Bleed the brake line after drum installation (see Brake Line Air Bleeding in the Brakes chapter).
● Be sure to check the brake system for good braking power, no brake drag and no fluid leakage.



⚠ WARNING

Do not attempt to drive the vehicle until a full brake pedal is obtained. Pump the brake pedal until the wheel cylinders operate and the brake shoes are against the drums. The brake will not function on the first application of the pedal if this is not done.

● Inspect the parking brake lever (see Parking Brake Lever Inspection).

Parking Brake Lever Inspection

● Check parking brake lever travel [A] by feeling clicks.
○Pull the parking brake lever [B] upward slowly all the way. Count the number of notches (clicks) during lever travel.
○The vehicle should not roll while parked.

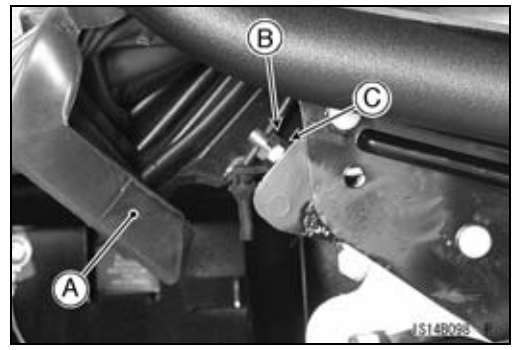
Parking Brake Lever Travel
Standard: 8 ~ 12 notches (clicks) at 200 N (20 kgf, 44 lb)

● Release the parking brake and return the lever to its rest position.



Periodic Maintenance Procedures

★If the lever travel is not correct, adjust it.
- Pull up the rubber boot [A].
- Loosen the locknut [B] and turn the adjusting nut [C] to obtain the correct amount of lever travel.
- Tighten the locknut.
- Check the parking brake for good braking power and when released, no brake drag.

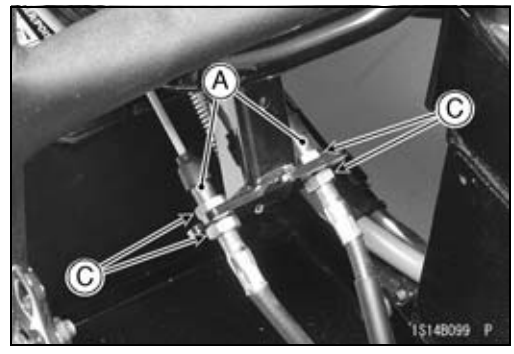


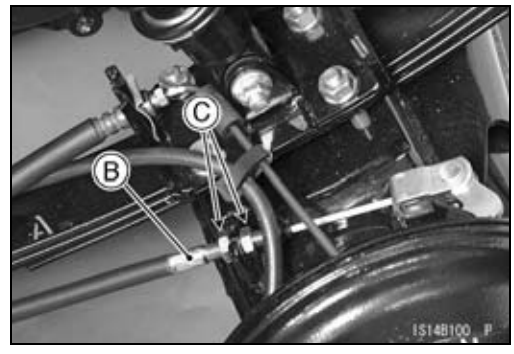
⚠ WARNING

Incorrect adjustment with insufficient free play can cause brakes to overheat and drag. Skidding and loss of control may result.

NOTE

○*If the parking brake lever travel cannot be adjusted with the adjusting nut at the lever, use the adjusters [A] behind the parking brake lever and adjusters [B] near the rear wheels. Be sure to adjust both the left and right cables evenly, and then securely tighten the adjuster mounting nuts [C].*

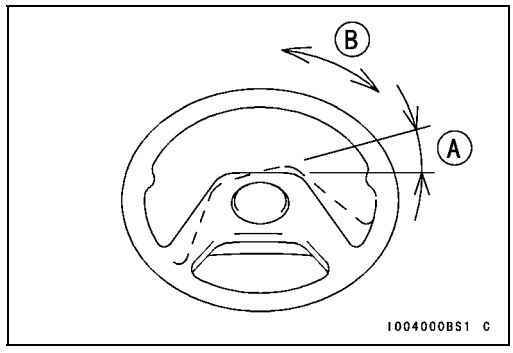




Periodic Maintenance Procedures

Steering

Steering Inspection



- Check steering wheel free play [A].

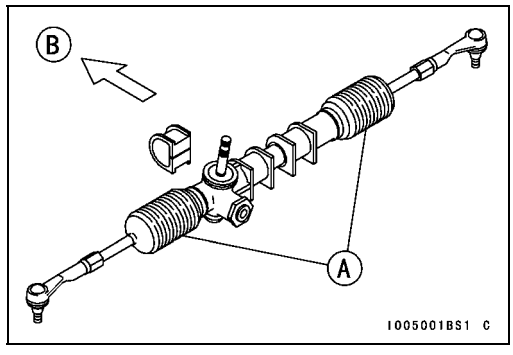
○Set the front wheels straight ahead. Gently turn [B] the steering wheel left and right. The steering wheel free play is the amount of travel in the steering wheel, before the front wheels begin to turn.

Steering Wheel Free Play
Standard: 0 ~ 20 mm (0 ~ 0.79 in.)

★If steering wheel free play is not correct, inspect the following.
Steering Wheel Mounting Nut (see Steering Wheel Centering in the Steering chapter)
Universal Joint Clamp Bolts (see Exploded View in the Steering chapter)
EPS Unit Mounting Bolts (see EPS Unit Installation in the Steering chapter)
Steering Gear Assembly Bracket Bolts (see Steering Gear Assembly Installation in the Steering chapter)
Steering Gear Assembly Mounting Rubber Dampers
Tie-Rod End Nuts (see Steering Gear Assembly Installation in the Steering chapter)
Steering Gear Preload Adjustment (see Steering Gear Preload Adjustment in the Steering chapter)

★If the inspections above are good but the free play is out of the specified, the steering gear assembly is damaged and should be replaced as a unit.

Steering Joint Dust Boot Inspection



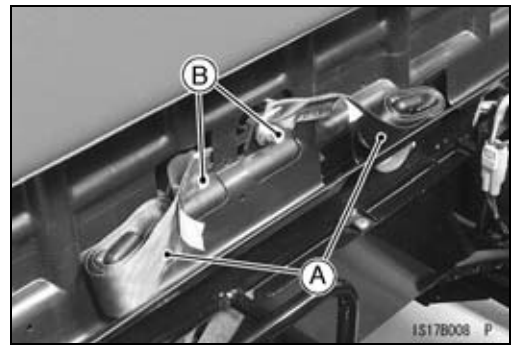
- Visually inspect the dust boots [A] at both the ends of the steering gear assembly.
Front [B]

★If there is any signs of deterioration, cracks, or damage, replace the steering gear assembly together with these boots.

Periodic Maintenance Procedures

Frame

Seat Belt Inspection



- Check the belts [A] for damage or tear.

★If necessary, replace the belt with a new one.

- Check the tightness torque of the following bolts.

Torque - Seat Belt Mounting Bolts [B]: 34 N·m (3.5 kgf·m, 25 ft·lb)
Seat Belt Buckle Mounting Bolts [C]: 34 N·m (3.5 kgf·m, 25 ft·lb)



- Check the operation of the buckle [A].

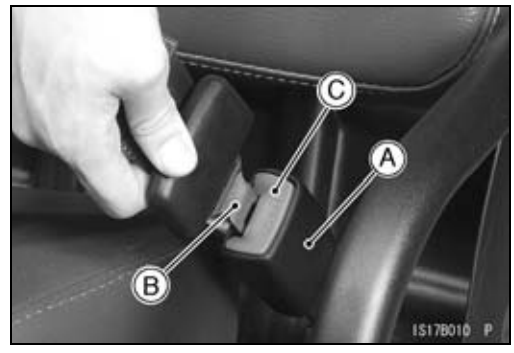
○Set the plate [B] in the buckle, and confirm the plate does not come off when pulling it.

○Set the plate in the buckle, and confirm the plate comes off when the buckle button [C] is pushed.

★If operation is not correct, visually inspect the plate.

★If the plate is damaged, replace the plate assembly with a new one.

★If the plate is not damaged, replace the buckle assembly.

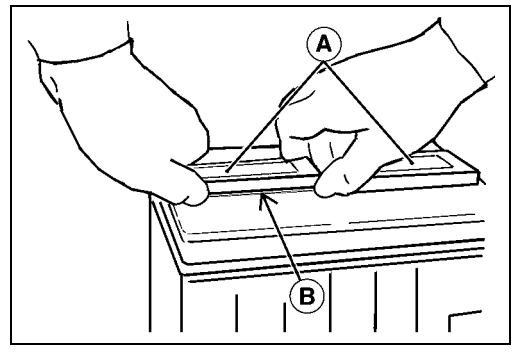


Electrical System

Electrolyte Level Inspection (Conventional Type Battery)

⚠ WARNING

Electrolyte contains sulfuric acid which is harmful to skin, eyes, and clothing.
Wear eye protection and rubber gloves.
If spillage occurs on body or clothing, rinse at once with water for at least 15 minutes.

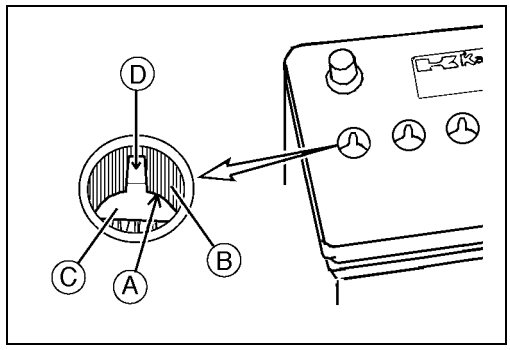


- Remove the filler caps [A] on the battery.

○Lift the side of the cap [B] opposite the terminals, and then lift the side of the cap nearest the terminals.

Periodic Maintenance Procedures

● The electrolyte level should be between the upper and lower levels.
○Upper level is bottom [A] of the split ring [B].
○Lower level is top of the plates [C].
★If the level of electrolyte in any cell is below the lower level, add only distilled water to the upper level of the cell.



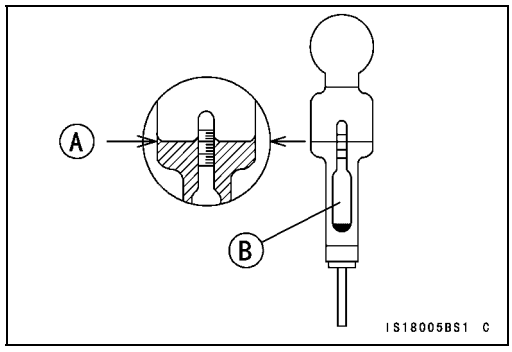
CAUTION

Ordinary tap water is not a substitute for distilled water and will shorten the life of the battery.
Do not fill into the split [D].
Do not overfill.

Electrolyte Specific Gravity Inspection (Conventional Type Battery)

⚠ WARNING

Electrolyte contains sulfuric acid which is harmful to skin, eyes, and clothing.
Wear eye protection and rubber gloves.
If spillage occurs on body or clothing, rinse at once with water for at least 15 minutes.



● Check battery condition by testing the specific gravity of the electrolyte in each cell with a hydrometer.
○Read the level [A] of the electrolyte on the floating scale [B].

Specific Gravity
Standard: 1.265 at 20°C (68°F)

★If the specific gravity is below 1.20 (charge 70%), the battery needs to be charged.

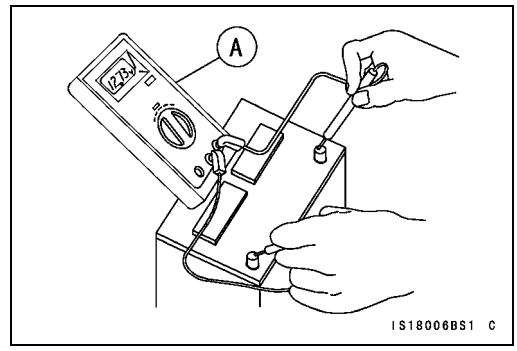
NOTE

○*The specific gravity of the electrolyte varies with changes in temperature, so the specific gravity reading must be corrected for the temperature of the electrolyte.*
○*Celsius: Add 0.007 points to reading for each 10°C (50°F) above 20°C (68°F) or subtract 0.007 points for each 10°C (50°F) below 20°C (68°F)*
○*Fahrenheit: Add 0.004 points to reading for each –12°C (10°F) above 20°C (68°F) or subtract 0.004 points for each –12°C (10°F) below 20°C (68°F)*

★If the specific gravity of any of the cells is more than 0.050 away from any other reading, the battery will probably not accept a charge. It is generally best to replace a battery in this condition.
★If the specific gravity of all the cells is 1.265 or more, the battery is fully charged.

Periodic Maintenance Procedures

Charging Condition Inspection (Conventional Type Battery)



○Battery charging condition can be checked by measuring battery terminal voltage.

● Disconnect the battery terminal cables.

CAUTION

Be sure to disconnect the negative terminal cables first.

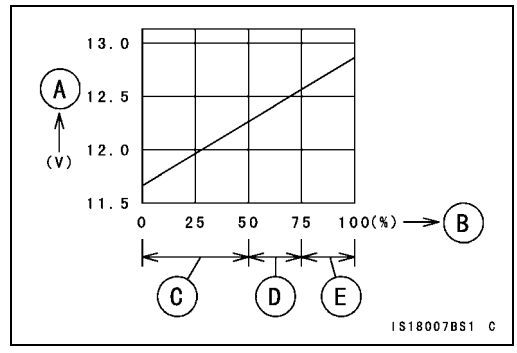
● Measure the battery terminal voltage.

NOTE

○*Measure with a digital voltmeter [A] which can be read to 0.1 volt.*

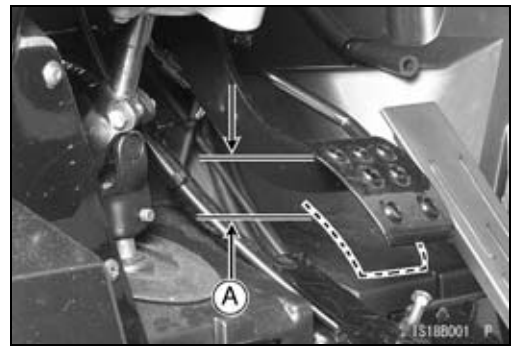
★If the reading is below the specified, refreshing charge is required.

Battery Terminal Voltage
Standard: 12.6 V or more



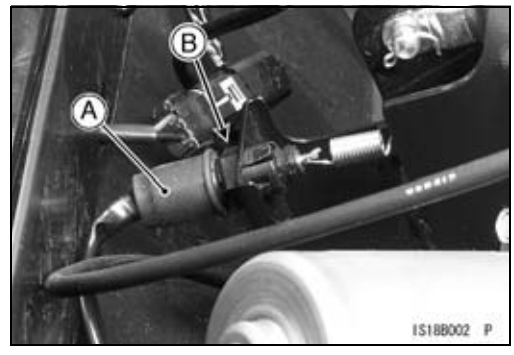
Terminal Voltage (V) [A]
Battery Charge Rate (%) [B]
Refresh charge is required [C]
Note [D]
Good [E]

Brake Light Switch Inspection



● Check the operation of the brake light switch by depressing the brake pedal. The brake light should go on after 10 mm (0.39 in.) of pedal travel [A].

★If it does not, adjust the brake light switch [A] up or down. To change the switch position, turn the adjusting nut [B].



Brake Light Switch Timing
Standard: ON after 10 mm (0.39 in.) of pedal travel

CAUTION

To avoid damaging the electrical connections inside the switch, be sure that the switch body does not turn during adjustment.

Periodic Maintenance Procedures

General Lubrication

- Before lubricating each part, clean off any rusty spots with rust remover and wipe off any grease, oil, dirt, or grime.
- Lubricate the points listed below with indicated lubricant.

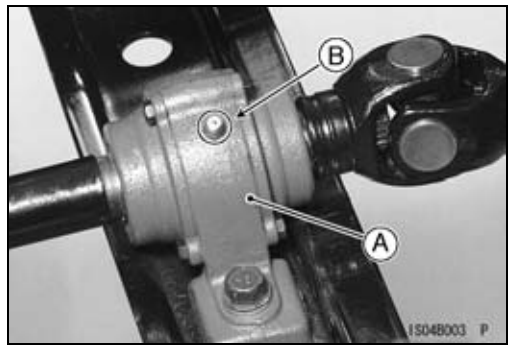
NOTE

○*Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure spray water, perform the general lubrication.*

Pivots and Points: Lubricate with Grease.

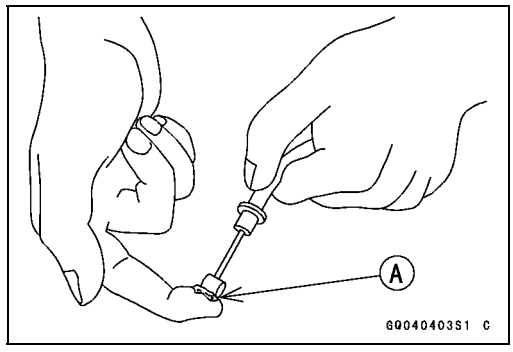
2WD/4WD Shift Lever Pivot
Brake Pedal Pivot
Cargo Bed Mounting Pins
Differential Shift Lever Pivot
Propeller Shaft Bearing [A] (under Seat)
Seat Brackets
Throttle Pedal Pivot
Transmission Shift Lever Pivot

○Grease the propeller shaft bearing using the grease nipple [B].



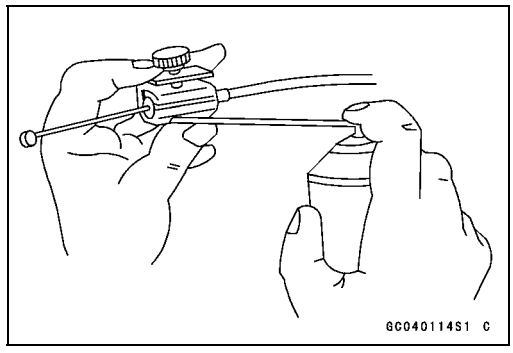
Cables: Lubricate with Grease.

2WD/4WD Shift Cable
Differential Shift Cable
Parking Brake Cables
Throttle Cable



Cables: Lubricate with Rust Inhibitor.

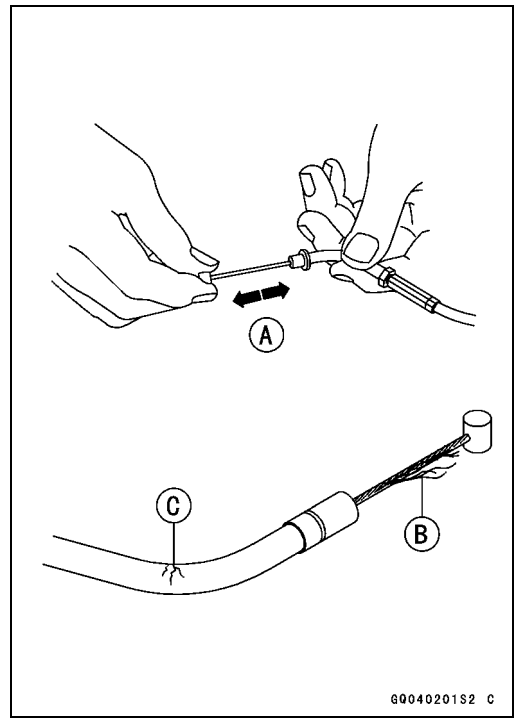
2WD/4WD Shift Cable
Differential Shift Cable
Throttle Cable



Periodic Maintenance Procedures

- With the cable disconnect at both ends, the cable should move freely [A] within the cable housing.

★If cable movement is not free after lubricating, if the cable is frayed [B], or if the cable housing is kinked [C], replace the cable.



Periodic Maintenance Procedures

Bolts, Nuts and Fasteners Tightness Inspection

● Check the tightness of the bolts and nuts listed here. Also, check to see that each cotter pin is in place and in good condition.

NOTE

○*Check the engine fastener tightness when the engine is cold (at room temperature).*

★If there are loose fasteners, first loosen by 1/2 turn, then retorque them to the specified torque following the specified tightening sequence. Refer to the appropriate chapter for torque specifications. If torque specifications are not in the appropriate chapter, see the basic torque table.

Bolt, Nut, and Fasteners to be checked

Engine
- Engine Mounting Bolts
- Exhaust Pipe and Muffler Joint Bolts
- Exhaust Pipe Holder Nuts
- Fuel Tank Bolt and Nut
- Muffler Mounting Bolts
- Throttle Pedal Pivot Cotter Pin

Transmission/Final Drive
- 2WD/4WD Shift Lever Pivot Snap Pin
- 2WD/4WD Shift Shaft Lever Mounting Nut
- Axle Nuts and Cotter Pins
- Differential Shift Cable Upper End Snap Pin
- Differential Shift Lever Pivot Snap Pin
- Differential Shift Shaft Lever Mounting Nut
- Hi/Low Shift Cable Upper End Snap Pin
- Hi/Low Shift Lever Pivot Snap Pin
- Hi/Low Shift Shaft Lever Mounting Nut
- Propeller Shaft Bearing Housing Nuts
- Shift Shaft Lever Clamp Bolts
- Transmission Shift Cable Upper End Snap Pin

Wheels
- Wheel Nuts

Brakes
- Brake Pedal Pivot Shaft Cotter Pin
- Master Cylinder Mounting Bolts
- Master Cylinder Push Rod Joint Cotter Pin
- Parking Brake Cable Lower End Joint Cotter Pins
- Parking Brake Lever Assembly Mounting Bolts

Suspension
- Front Suspension Arm Pivot Bolts
- Leaf Spring Mounting Nuts
- Rear Shock Absorber Mounting Nuts
- Strut Clamp Nuts and Cotter Pins
- Strut Mounting Locknuts

Periodic Maintenance Procedures

Steering
- Front Suspension Arm Joint Nuts and Cotter Pins
- Steering Shaft Mounting Bolts and Nuts
- Steering Wheel Mounting Nut
- Tie-Rod End Locknuts
- Tie-Rod End Nuts and Cotter Pins
- Universal Joint Clamp Bolts

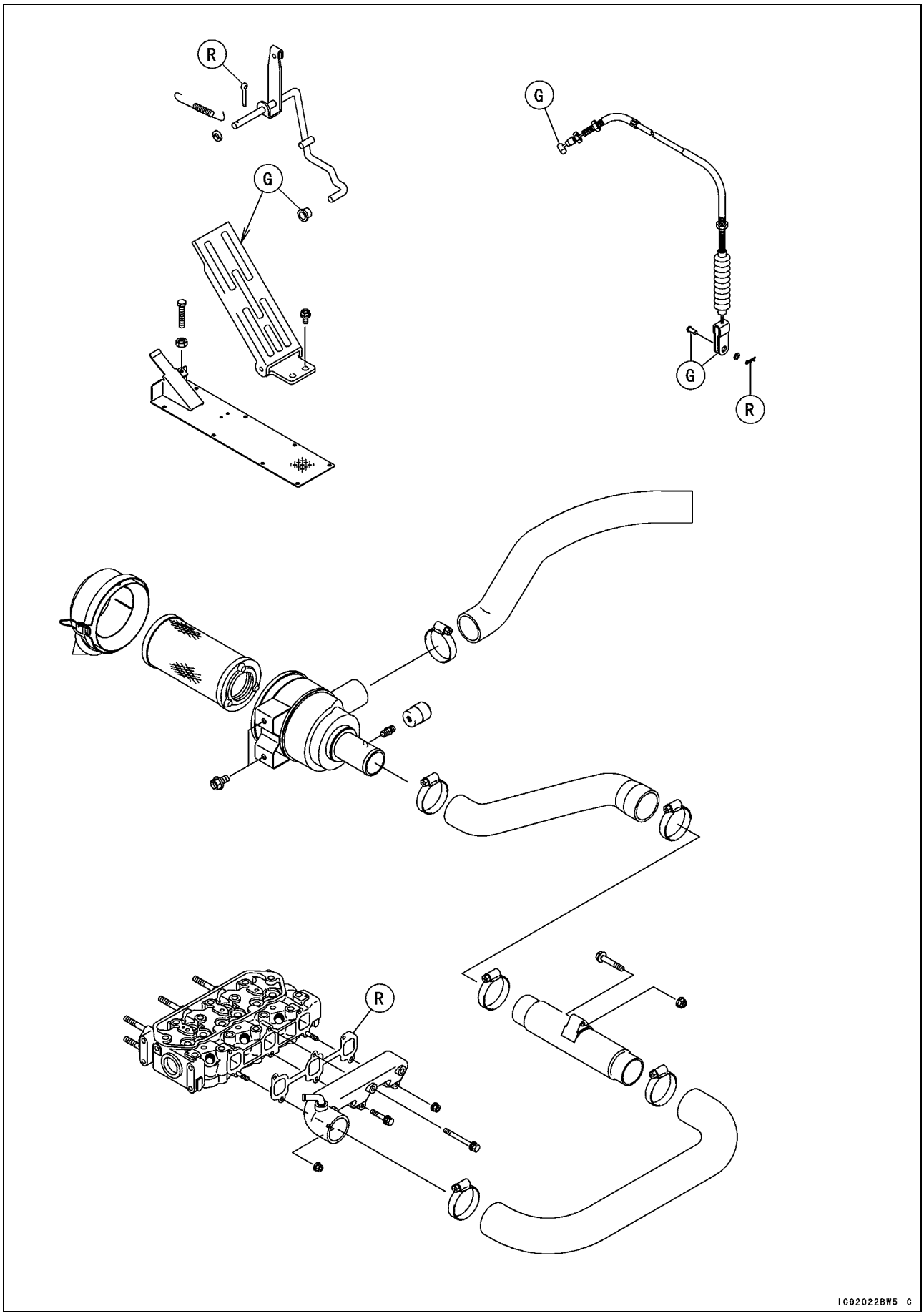
Frame
- Battery Holder Mounting Nuts
- Cargo Bed Hook Mounting Bolts
- Cargo Bed Mounting Pin Snap Pins
- Front and Rear Bar Mounting Bolts and Nuts
- Seat Back Mounting Nuts
- Seat Belt Mounting Bolts
- Seat Belt Buckle Mounting Bolts
- Front Final Gear Case Skid Plate Mounting Bolts
- Front Guard Nuts
- Rear End Subframe Mounting Nuts
- Seat Bracket Nuts

Fuel System

Table of Contents

Exploded View 3-2
Specifications 3-6
Special Tool 3-7
Throttle Pedal and Cable 3-8
Throttle Pedal Play Inspection 3-8
Throttle Pedal Play Adjustment 3-8
Full Throttle Pedal Position Adjustment 3-8
Throttle Cable Installation 3-9
Throttle Cable Lubrication 3-9
Throttle Cable Inspection 3-9
Fuel Injection Nozzle 3-10
Fuel Injection Nozzle Removal 3-10
Fuel Injection Nozzle Installation 3-10
Fuel Injection Nozzle Inspection 3-10
Fuel Injection Pump 3-13
Idle Speed Inspection 3-13
Idle Speed Adjustment 3-13
Maximum Engine Speed Inspection 3-13
Maximum Engine Speed Adjustment 3-13
Fuel Injection Pipe Removal 3-13
Fuel Injection Pipe Installation 3-14
Fuel Injection Pump Removal 3-15
Fuel Injection Pump Installation 3-15
Fuel Injection Pump Timing Inspection 3-16
Fuel Injection Pump Timing Adjustment 3-17
Fuel Injection Pump Inspection and Repair 3-19
Fuel Injection Pump Troubleshooting 3-20
Air Cleaner 3-27
Air Cleaner Element Cleaning 3-27
Air Cleaner Housing Removal 3-28
Air Cleaner Housing Dust and/or Water Inspection 3-28
Fuel Filter 3-29
Fuel Filter Removal 3-29
Fuel Filter Installation 3-29
Fuel Filter Cartridge Replacement 3-29
Water Draining 3-29
Fuel Tank 3-30
Fuel Tank Removal 3-30
Fuel Tank Installation 3-30
Fuel Tank Cleaning/Inspection 3-31
Fuel Level Gauge Removal 3-31
Fuel Level Gauge Installation 3-32
Fuel Level Gauge Check 3-32

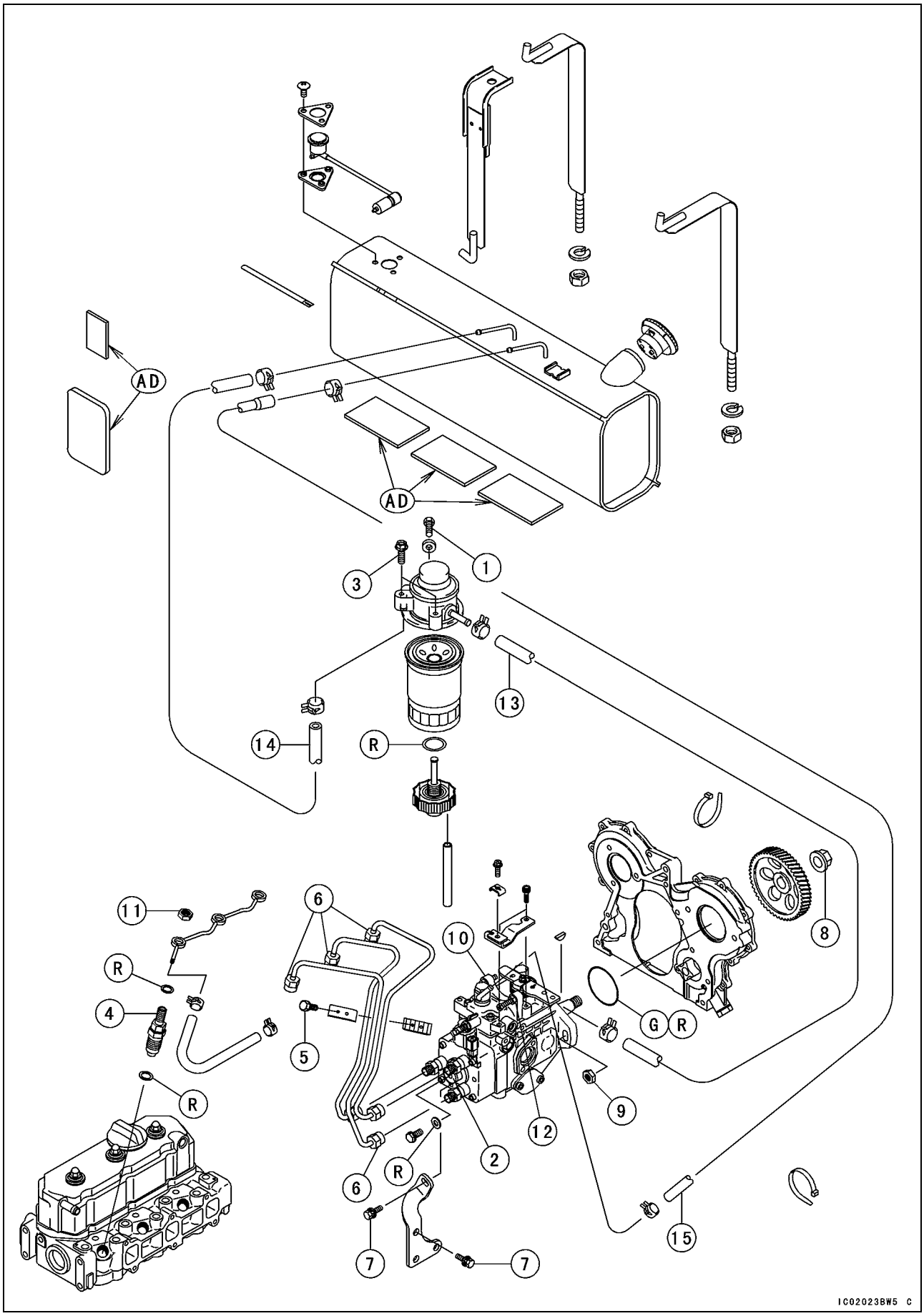
Exploded View



Exploded View

G: Apply grease.
R: Replacement Parts

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Air Vent Plug	5.0	0.51	44 in·lb	
2	Distributor Head Bolt	17	1.7	12	
3	Fuel Filter Mounting Bolts	20	2.0	15	
4	Fuel Injection Nozzles	59	6.0	44	
5	Fuel Injection Pipe Clamp Bolts	7.4	0.75	65 in·lb	
6	Fuel Injection Pipe Mounting Nuts	25	2.5	18	
7	Fuel Injection Pump Bracket Bolts	20	2.0	15	
8	Fuel Injection Pump Gear Nut	64	6.5	47	
9	Fuel Injection Pump Mounting Nuts	20	2.0	15	
10	Idle Adjusting Screw Locknut	6.9	0.70	61 in·lb	
11	Linkage Pipe Nuts	27	2.8	20	
12	Maximum Speed Set Screw Locknut	6.9	0.70	61 in·lb	

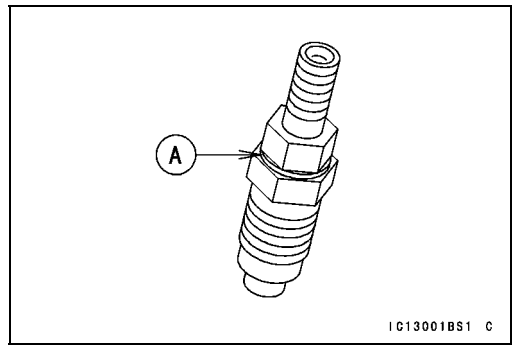
13. Fuel Output Hose (from Fuel Filter to Fuel Injection Pump)
14. Fuel Output Hose (from Fuel Tank to Fuel Filter)
15. Fuel Return Hose (from Fuel Injection Pump to Fuel Tank)

AD: Apply adhesive.
G: Apply grease.
R: Replacement Parts

Specifications

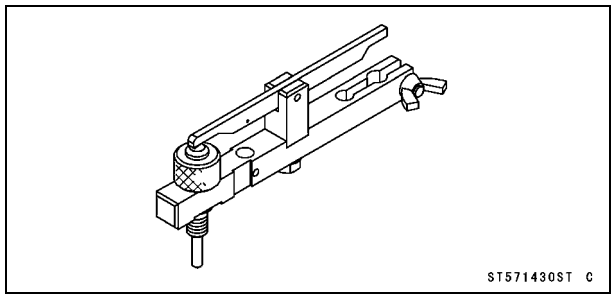
Item	Standard	Service Limit
Throttle Pedal and Cable		
Throttle Pedal Play	5 ~ 10 mm (0.20 ~ 0.39 in.)	– – –
Fuel Injection Nozzle		
Fuel Injection Nozzle Injection Pressure:		
Marking of Injection Nozzle:		
Red or Green	13 239 ~ 14 220 kPa (135 ~ 145 kgf/cm², 1 920 ~ 2 062 psi)	– – –
None	14 465 ~ 14 955 kPa (147.5 ~ 152.5 kgf/cm², 2 098 ~ 2 169 psi)	– – –
Fuel Injection Pump		
Idle Speed	850 ~ 950 r/min (rpm)	– – –
Maximum Engine Speed (No Load)	3 800 ~ 3 900 r/min (rpm)	– – –
Injection Timing (Plunger Stroke):		
Marking of Injection Nozzle:		
Red or Green	0.81 ±0.03 mm (0.0319 ±0.0012 in.)	– – –
None	0.81 ±0.02 mm (0.0319 ±0.0008 in.)	– – –

Injection Nozzle Mark Position [A]



Special Tool

Dial Gauge Adapter:
57001-1430



Throttle Pedal and Cable

Throttle Pedal Play Inspection

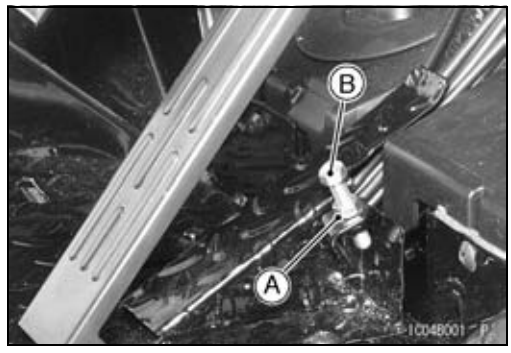
- Refer to the Throttle Pedal Play Inspection in the Periodic Maintenance chapter.

Throttle Pedal Play Adjustment

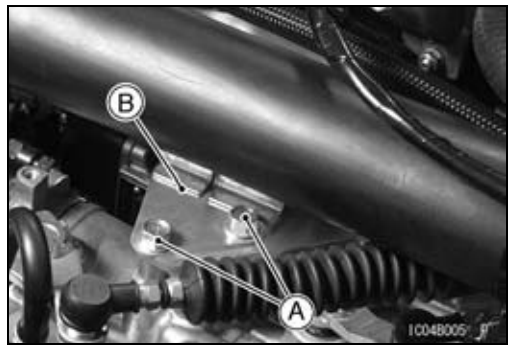
- Refer to the Throttle Pedal Play Adjustment in the Periodic Maintenance chapter.

Full Throttle Pedal Position Adjustment

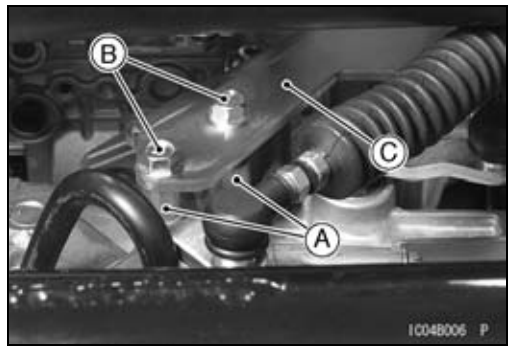
- Loosen the locknut [A].
- Screw in the throttle pedal stop bolt [B].



- Tilt up the cargo bed.
- Remove:
  Injection Pump Cover Bolts [A] and Collars
  Injection Pump Cover [B]



- Reinstall the collars [A] and tighten the pump cover bolts [B] together with the bracket [C] temporary.



- Depress the throttle pedal until the speed control lever [A] on the injection pump is in the fully opened position, and hold it there.
- Turn the throttle pedal stop bolt until the bolt head lightly touches the bottom of the throttle pedal.
- Tighten the locknut securely.



Throttle Pedal and Cable

Throttle Cable Installation

- Run the throttle cable correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Adjust the throttle pedal play adjustment (see Throttle Pedal Play Adjustment in the Periodic Maintenance chapter).

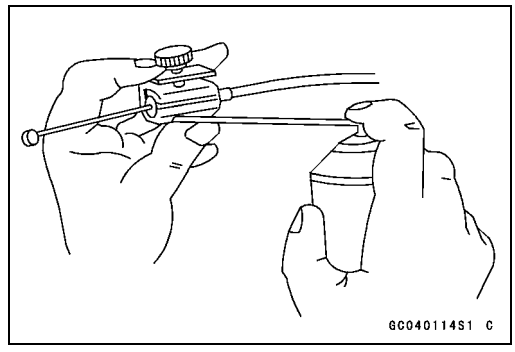
⚠ WARNING

Operation with incorrectly routed or improperly adjusted cable could result in an unsafe operating condition.

Throttle Cable Lubrication

Whenever the throttle cable is removed, lubricate the cable as follows.

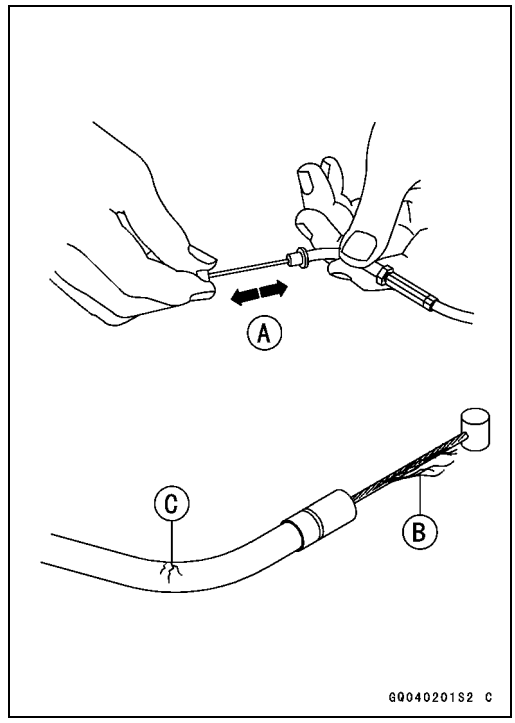
- Apply a thin coating of grease to the cable upper and lower ends.
- Lubricate the cable with a penetrating rust inhibitor through a pressure cable luber.



Throttle Cable Inspection

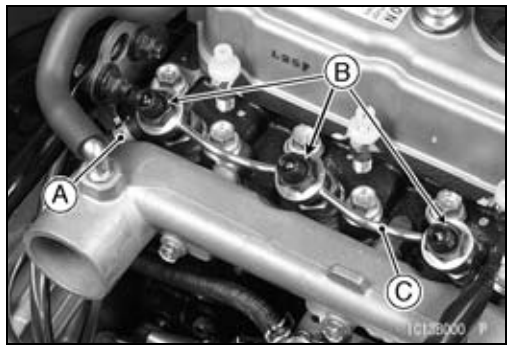
- With the throttle cable disconnected at both ends, the cable should move freely [A] within the cable housing.

★If the cable does not move freely after lubricating, if the cable is frayed [B], or if the housing is kinked [C], replace the cable.

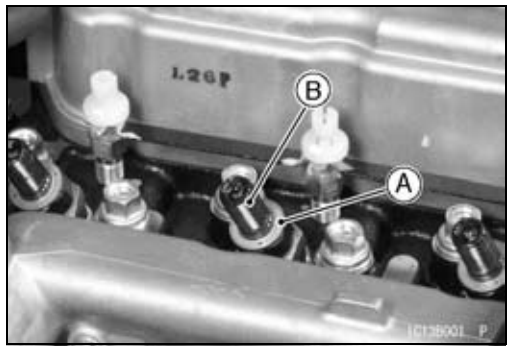


Fuel Injection Nozzle

Fuel Injection Nozzle Removal



- Tilt up the cargo bed.
- Remove:
  Fuel Injection Pipes (see Fuel Injection Pipe Removal)
  Fuel Return Hose [A]
  Linkage Pipe Nuts [B]
  Linkage Pipe [C]

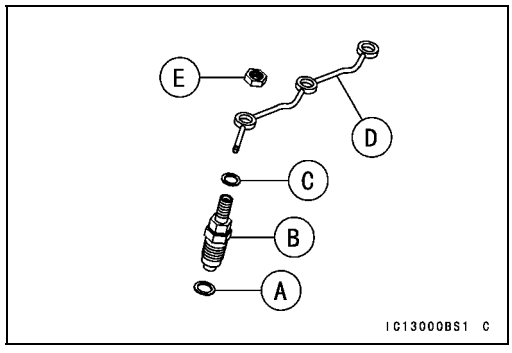


- Remove:
  Washer [A]
  Fuel Injection Nozzle [B] and Gasket

CAUTION

Handle the fuel injection nozzles with extreme care. Do not drop the nozzles.

Fuel Injection Nozzle Installation



- Replace the gasket [A] with a new one.
- Install the fuel injection nozzle [B].

Torque - Fuel Injection Nozzles: 59 N·m (6.0 kgf·m, 44 ft·lb)

- Replace the washer [C] with a new one.
- Install:
  Linkage Pipe [D]
  Linkage Pipe Nuts [E]

Torque - Linkage Pipe Nuts: 27 N·m (2.8 kgf·m, 20 ft·lb)

- Install:
  Fuel Return Hose
  Fuel Injection Pipes (see Fuel Injection Pipe Installation)

Fuel Injection Nozzle Inspection

⚠ WARNING

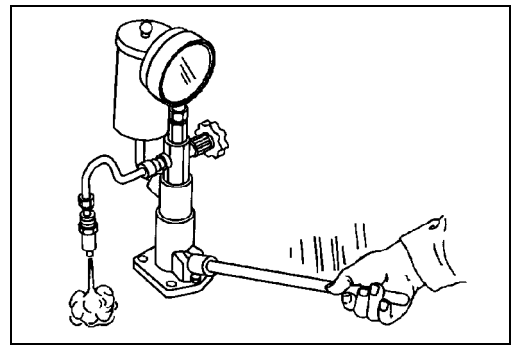
The injected fuel is highly flammable. Don't draw a flame near the injected fuel. Fuel is highly pressurized and has enough kinetic energy just after sprayed to penetrate into the human body causing injury. Don't place your fingers, hands, or other parts of your body close to the nozzle during injection nozzle tests in the air. Stay 30 cm (12 in.) or more a way from the nozzle.

NOTE

○*Refer to the Fuel Injection Pump Inspection and Repair for nozzle repair information.*

Fuel Injection Nozzle

Injection Pressure Check



- Install the fuel injection nozzle on a nozzle tester.
- Quickly move the tester lever up and down so that the injection nozzle sprays two to three times.

○This step blows off any carbon deposits on the injection nozzle port.

- Move the lever very slowly, gradually raising the pressure.
- Measure the maximum pressure just as the pointer of the pressure gauge drops suddenly.

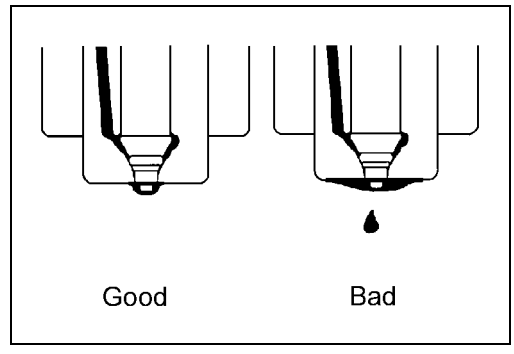
Fuel Injection Nozzle Injection Pressure

Marking of Injection Nozzle:

Red or Green:	**13 239 ~ 14 220 kPa (135 ~ 145 kgf/cm², 1 920 ~ 2 062 psi)**
None:	**14 465 ~ 14 955 kPa (147.5 ~ 152.5 kgf/cm², 2 098 ~ 2 169 psi)**

★If the measured pressure does not comply with the specification, replace the injection nozzle.

Leakage Check



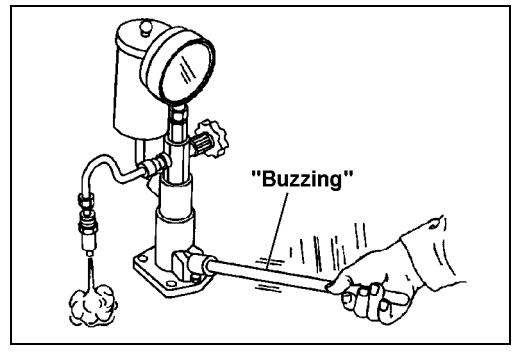
(When there is a mark (green or red) on the nozzle.)

- Slowly depress the tester lever, until the pressure reaches about 11 768 kPa (120 kgf/cm², 1 706 psi.)

(When there is no mark on the nozzle.)

- Slowly depress the tester lever, until the pressure reaches about 12 749 kPa (130 kgf/cm², 1 849 psi.)

Checking for "Buzzing" and Spray Pattern



- Operate the tester lever at a rate of 30 to 60 strokes per minute in the case of a new nozzle; 15 to 60 strokes per minute in the case of a used nozzle.
- Make sure that "buzzing" occurs during these strokes.

NOTE

○*When this "buzzing" occurs, you can feel a pulsation transmitted to your hand through the nozzle tester handle while the nozzle injection is taking place.*

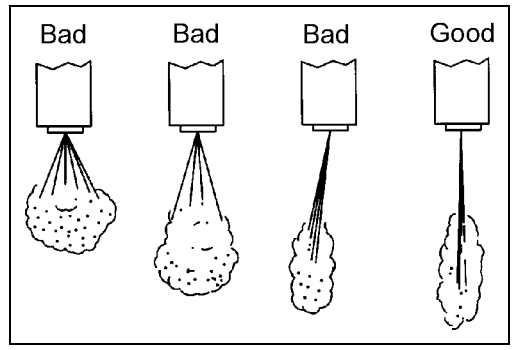
○*When the pressurized fuel from the injection pump is injected, this injection is accompanied by rapid, recurring pressure variations during the time from the start to the finish of the injection. These pulsing pressure variations are felt as "buzzing".*

○*These pulsations of the fuel are affected mainly by the movement of the nozzle needle and good or bad conditions of the valve seat section.*

○*Generally, a nozzle that "buzzes" is good, because a spray condition where intermittent pulsations are generated assures good "cut-off" of the fuel supply.*

Fuel Injection Nozzle

- Ensure that the fuel spray forms a cone shape while the “buzzing” is occurring, and that the center of the cone is aligned with the center line of the nozzle.
- Ensure that the nozzle does not drip.



Fuel Injection Pump

Idle Speed Inspection

- Refer to the Idle Speed Inspection in the Periodic Maintenance chapter.

Idle Speed Adjustment

- Refer to the Idle Speed Adjustment in the Periodic Maintenance chapter.

Maximum Engine Speed Inspection

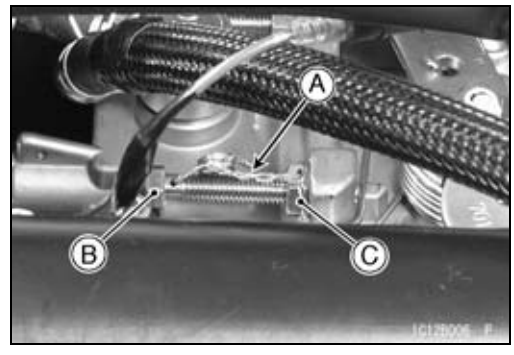
- Check the full throttle pedal position (see Full Throttle Pedal Position Adjustment).
- Set the parking brake.
- Be sure the transmission is in neutral.
- Start the engine and warm it up thoroughly.
- Tilt up the cargo bed.
- Check the maximum engine speed with a suitable tachometer.

Maximum Engine Speed (No Load)
Standard: 3 800 ~ 3 900 r/min (rpm)

★If the maximum engine speed is not in the specified range, adjust it.

Maximum Engine Speed Adjustment

- Set the parking brake.
- Be sure the transmission is in neutral.
- Tilt up the cargo bed.
- Remove the fuel injection pump cover (see Full Throttle Pedal Position Adjustment).



- Cut and remove the wire [A] on the maximum speed set screw [B].
- Start the engine and warm it up thoroughly.
- Loosen the locknut [C].
- Turn the maximum speed set screw until the maximum engine speed is correct.
- Tighten:

Torque - Maximum Speed Set Screw Locknut: 6.9 N·m (0.70 kgf·m, 61 in·lb)

- Lock the maximum speed set screw with a wire or paint on the locknut and pump housing.

Fuel Injection Pipe Removal

⚠ WARNING

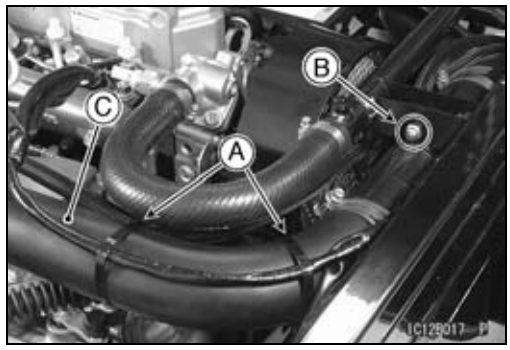
Fuel is extremely flammable and can be explosive under certain conditions. Turn the main switch OFF. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

CAUTION

Take care to prevent any dirt from entering injection nozzle holes or delivery valve ports when fuel delivery lines are removed.

Fuel Injection Pump

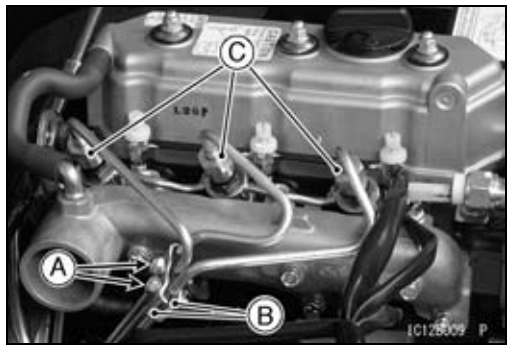
● Cut the bands [A].
● Remove:
Air Duct Mounting Bolt and Nut [B]
Air Duct [C]



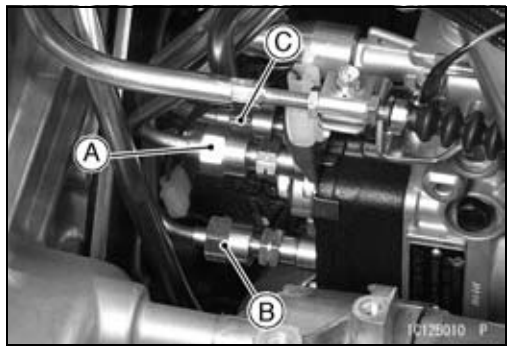
● Remove the air duct [A].



● Remove:
Fuel Injection Pipe Clamp Bolts [A]
Fuel Injection Pipe Clamps [B]
● Loosen the fuel injection pipe upper nuts [C].



● Remove:
Fuel Injection Pipe No. 3 Lower Nut [A] and Upper Nut
Fuel Injection Pipe No. 1 Lower Nut [B] and Upper Nut
Fuel Injection Pipe No. 2 Lower Nut [C] and Upper Nut

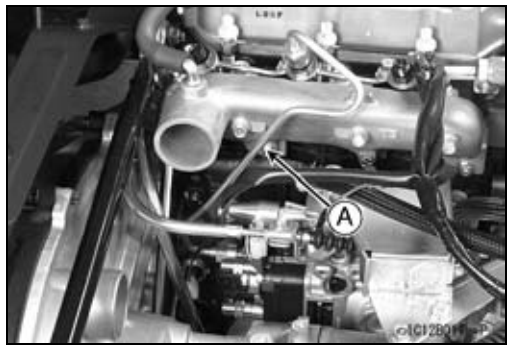


Fuel Injection Pipe Installation

● Install the fuel injection pipes using the following steps.
○First, install the No. 2 injection pipe [A].
○Secondly, install the No. 1 injection pipe.
○Finally, install the No. 3 injection pipe.

NOTE

○*Tighten the upper and lower nuts temporarily and then tighten them to the specified torque.*

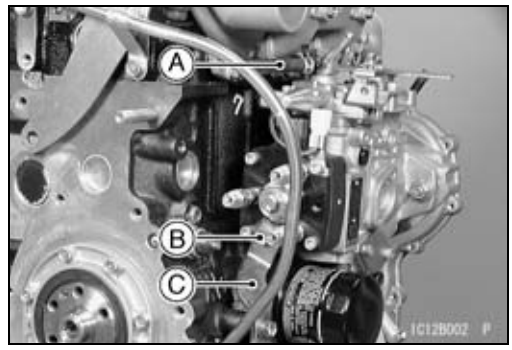


● Tighten:

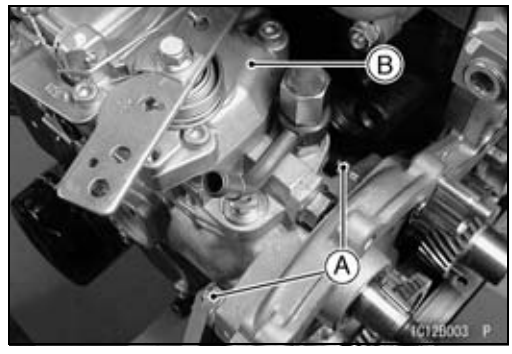
Torque - Fuel Injection Pipe Mounting Nuts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Fuel Injection Pipe Clamp Bolts: 7.4 N·m (0.75 kgf·m, 65 in·lb)

Fuel Injection Pump

Fuel Injection Pump Removal

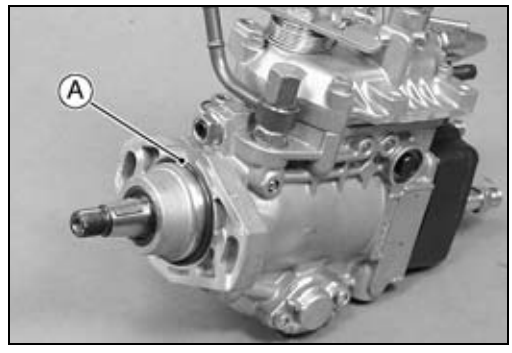


● Remove:
Engine (see Engine Removal in the Engine Removal/Installation chapter)
Fuel Injection Pump Drive Gear (see Timing Gear Case Removal in the Crankshaft/Crankcase chapter)
Fuel Injection Pipes (see Fuel Injection Pipe Removal)
Fuel Return Hose [A]
Fuel Injection Pump Bracket Bolts [B]
Fuel Injection Pump Bracket [C]

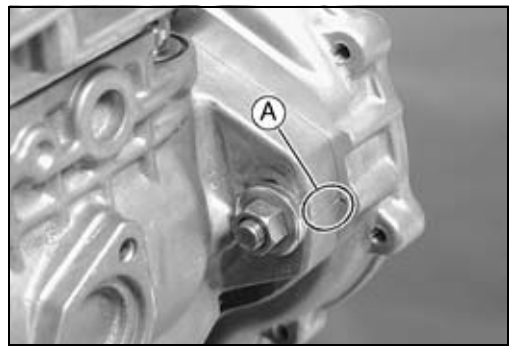


● Remove:
Fuel Injection Pump Mounting Nuts [A]
Fuel Injection Pump [B]

Fuel Injection Pump Installation



● Replace the O-ring [A] with a new one.



● Install the fuel injection pump temporary.
○Align the timing marks [A] on the injection pump and timing gear case.
○Tighten the mounting nuts with fingers.

Fuel Injection Pump

- Install:
  Fuel Injection Pump Drive Gear, Timing Gear Case Cover and Crankshaft Pulley (see Timing Gear Case Installation in the Crankshaft/Crankcase chapter)
- Adjust the fuel injection pump timing (see Fuel Injection Pump Timing Inspection).
- Tighten:

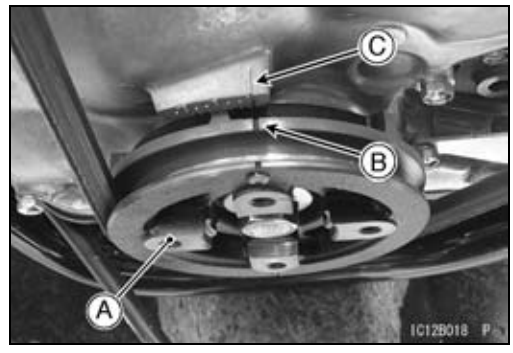
Torque - Fuel Injection Pipe Mounting Nuts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Fuel Injection Pipe Clamp Bolts: 7.4 N·m (0.75 kgf·m, 65 in·lb)

- Adjust:
  Maximum Engine Speed (New Injection Pump) (see Maximum Engine Speed Adjustment)
  Idle Speed (see Idle Speed Adjustment in the Periodic Maintenance chapter)

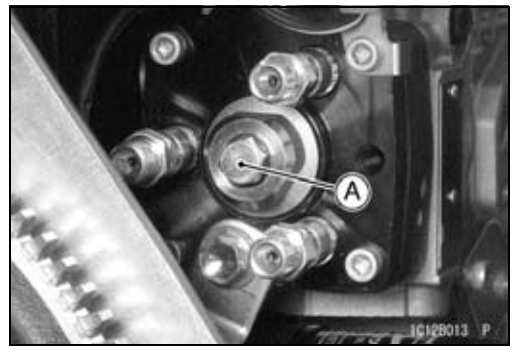
Fuel Injection Pump Timing Inspection

- Remove:
  Fan Belt Cover (see Cooling Fan Belt Inspection in the Periodic Maintenance chapter)
  Fuel Injection Pipes (see Fuel Injection Pipe Removal)
  Cylinder Head Cover (see Rocker Arm Components Removal in the Engine Top End chapter)
  Oil Level Gauge Pipe (see End Plate Removal in the Crankshaft/Crankcase chapter)
  Torque Converter Case (see Torque Converter Case Removal in the Converter System chapter)

- Turn the crankshaft pulley [A] clockwise, and position the crankshaft at #1 piston TDC on the compression stroke.
  ○Align the timing mark [B] on the crankshaft pulley and reference point [C] on the timing case cover.
  ○If the inlet and exhaust valves for #1 cylinder have no clearance, turn the crankshaft pulley one revolution.



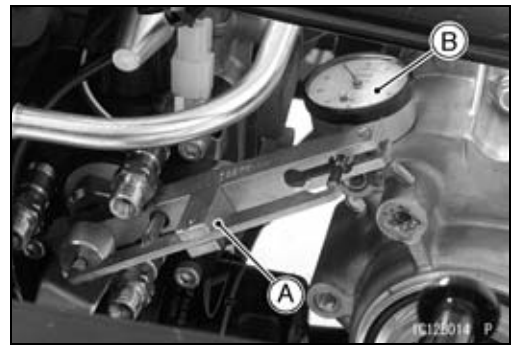
- Remove the distributor bolt [A].



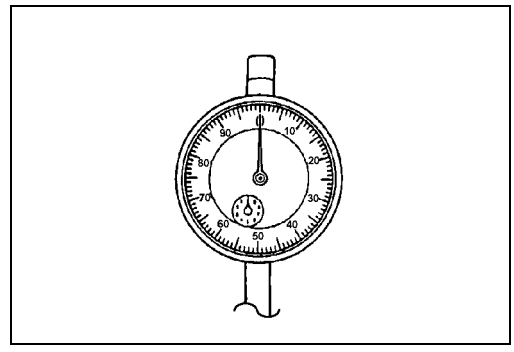
Fuel Injection Pump

● Install the dial gauge adapter [A] and dial gauge [B].

Special Tool - Dial Gauge Adapter: 57001-1430



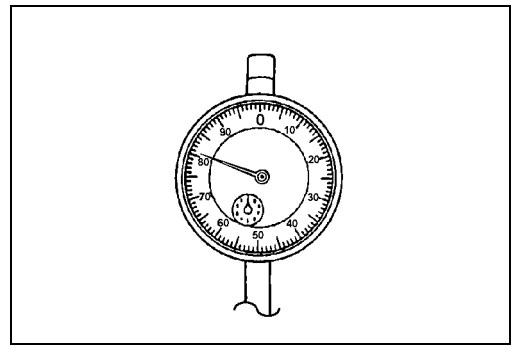
● Slowly turn the crankshaft pulley counterclockwise about 30° until the dial gauge needle stops. Pump plunger lift is zero at this point.
● Set the dial gauge to the "0" position.



● Slowly turn the crankshaft pulley clockwise, stopping at #1 piston TDC on the compression stroke.

NOTE

○*Do not turn the crankshaft pulley past TDC. If the crankshaft pulley is turned past TDC, turn the crankshaft back to "0" on the dial gauge and repeat the procedure.*



● Note dial gauge reading.

Injection Timing (Plunger Stroke)
Marking of Injection Nozzle:
Red or Green: 0.81 ±0.03 mm (0.0319 ±0.0012 in.)
None: 0.81 ±0.02 mm (0.0319 ±0.0008 in.)

★If the gauge reading is within the specification, the injection pump is properly timed.
★If the gauge reading is not within the specification, adjust the injection pump timing (see Fuel Injection Pump Timing Adjustment).

Fuel Injection Pump Timing Adjustment

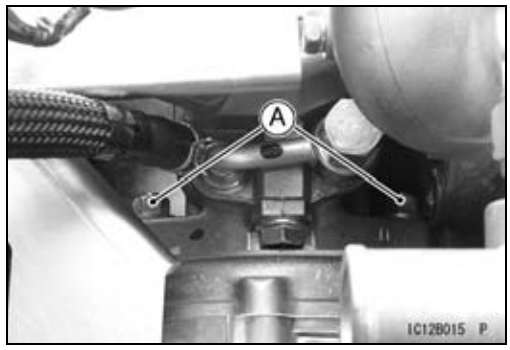
● Inspect the fuel injection pump timing.

NOTE

○*Do not turn the crankshaft pulley past TDC. If the crankshaft pulley is turned past TDC, turn the crankshaft back to "0" and repeat the procedure.*

Fuel Injection Pump

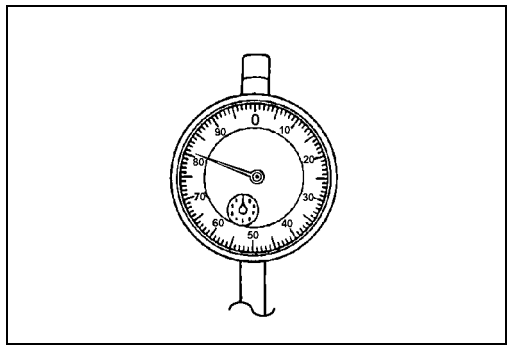
- Loosen the fuel injection pump mounting nuts [A].



- Loosen the fuel injection pump bracket bolt [A].



- While observing the dial gauge, slowly rotate the fuel injection pump away from the cylinder head until gauge reads 0.81 ±0.03 mm (0.0319 ±0.0012 in.).
- Hold the fuel injection pump in this position and tighten the fuel injection pump mounting nuts.



NOTE

○*Do not rotate the pump past the specification. If the pump is rotated past the specification, rotate the pump back toward the cylinder head and repeat the procedure.*

- Tighten:

Torque - Fuel Injection Pump Mounting Nuts: 20 N·m (2.0 kgf·m, 15 ft·lb)
Fuel Injection Pump Bracket Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)

- To verify that the timing is correct, turn the crankshaft pulley counterclockwise until the dial indicator reads “0”.
- Then turn the crankshaft pulley clockwise until the timing mark on the crankshaft pulley aligns with reference point on the timing case cover.
- The indicator should be within the specification.

Injection Timing (Plunger Stroke)

0.81 ±0.03 mm (0.0319 ±0.0012 in.)

★If the indicator reading is not within the specification, repeat the procedure.

- Remove the dial gauge adapter and dial gauge.
- Install the distributor head bolt and washer.
- Tighten:

Torque - Distributor Head Bolt: 17 N·m (1.7 kgf·m, 12 ft·lb)

Fuel Injection Pump

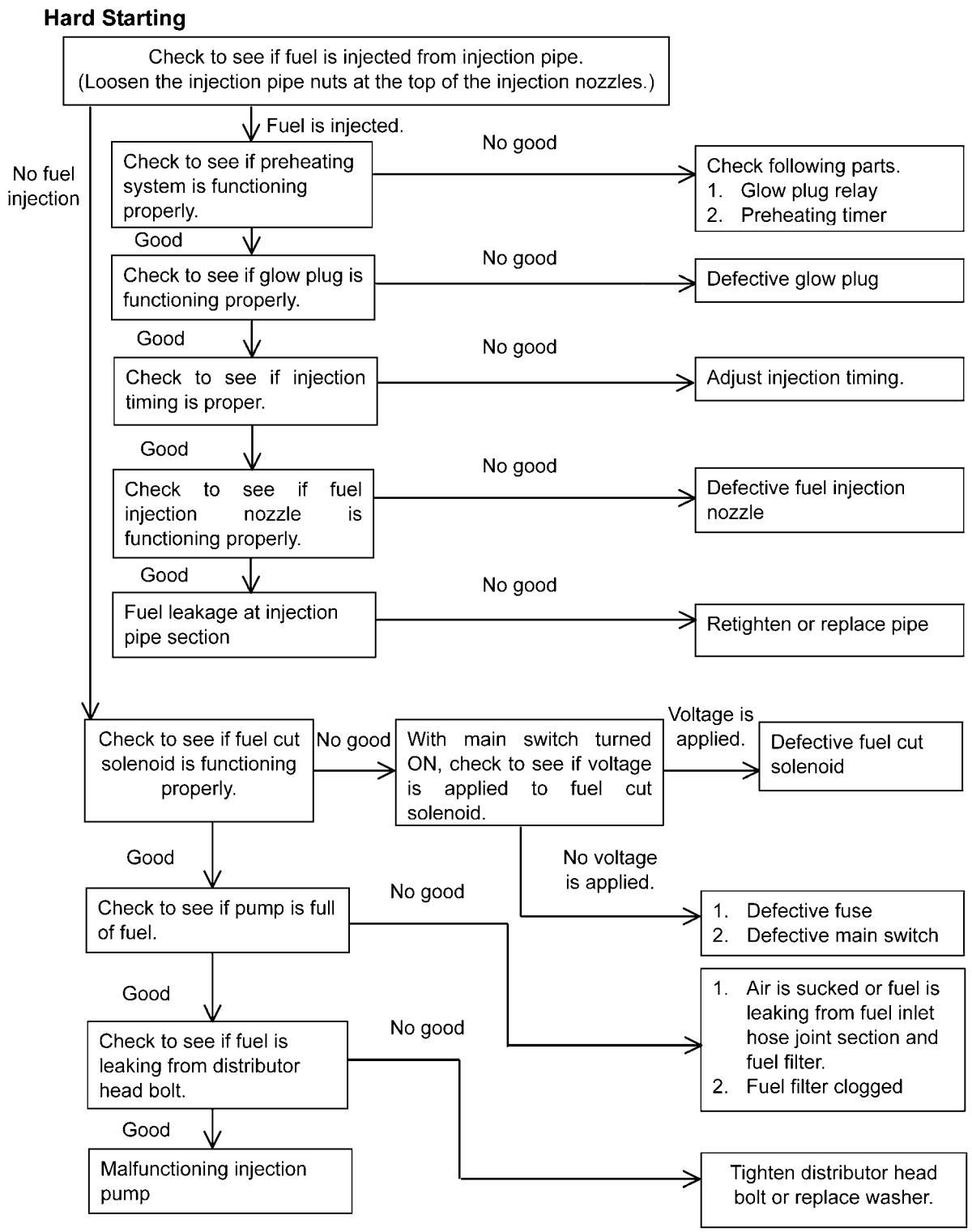
Fuel Injection Pump Inspection and Repair

NOTE

○*Do not disassemble the fuel injection pump and injection nozzles. The pump and nozzles are produced in highly automated modern production facilities. They cannot be assembled by hand in the field.*

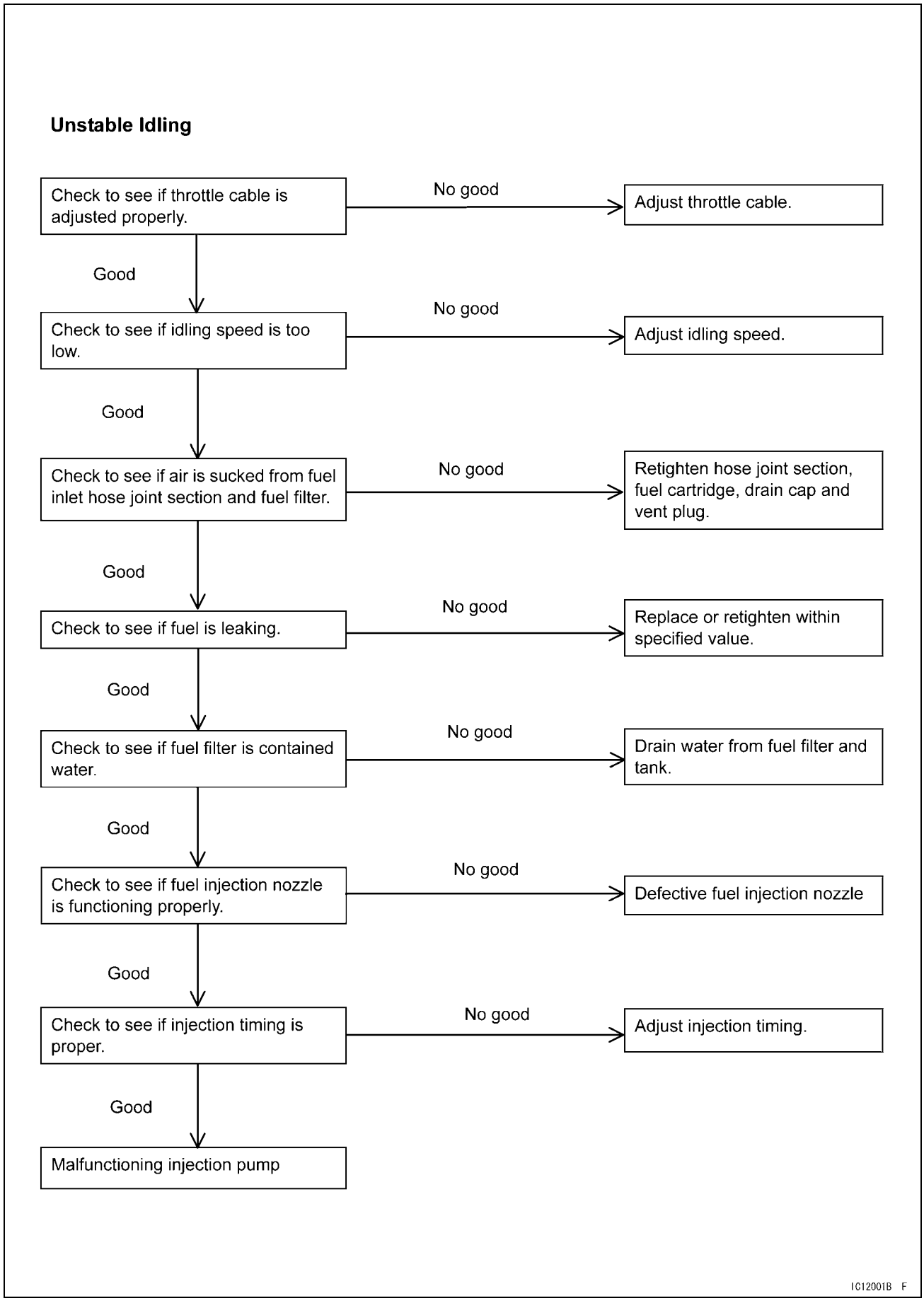
● Refer to the troubleshooting section to check of the pump.
★ If the pump and nozzle are malfunction, replace them, or consult a reliable repair shop (ex. Denso Service Station).

Fuel Injection Pump Troubleshooting

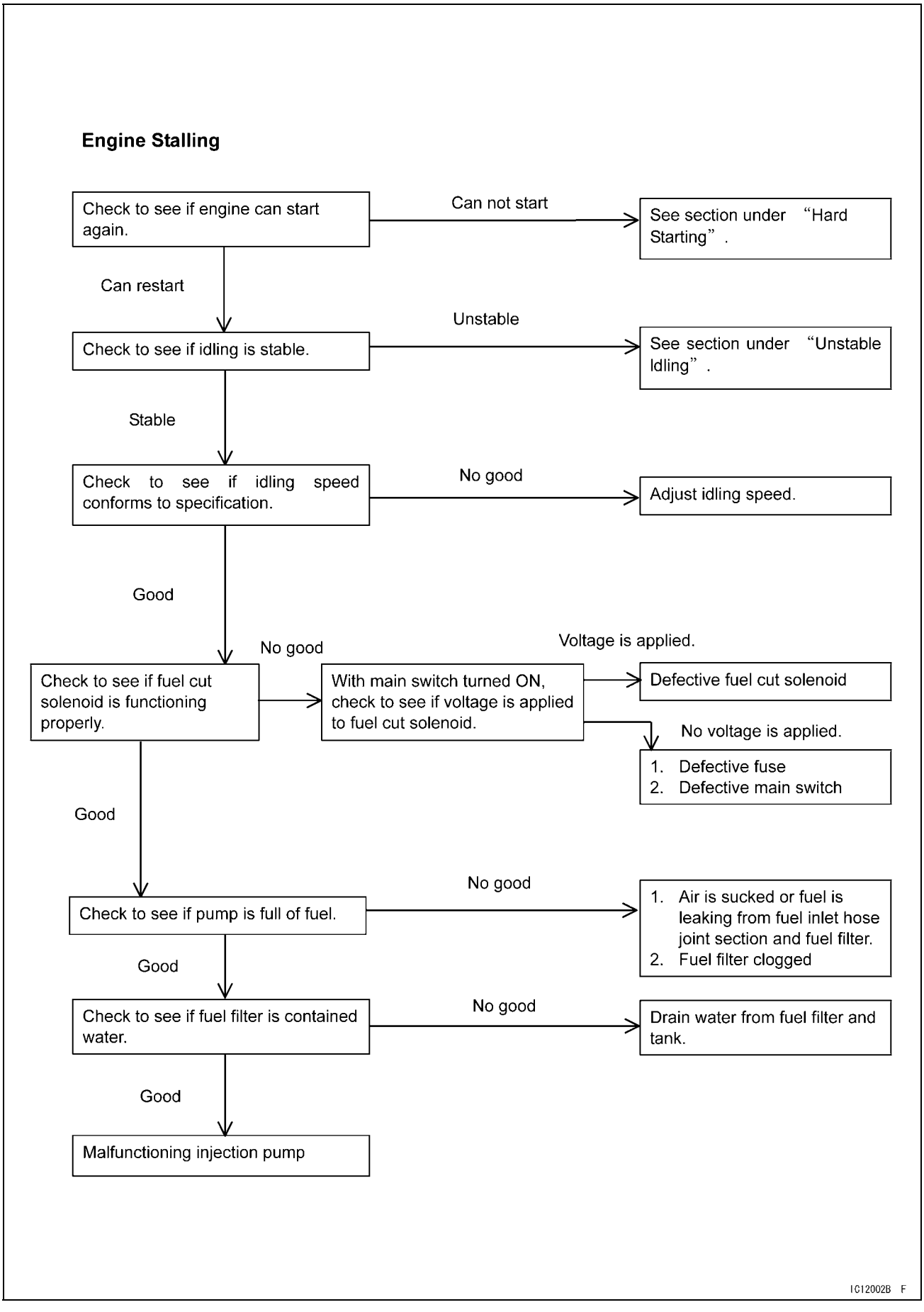

Hard Starting
Check to see if fuel is injected from injection pipe. (Loosen the injection pipe nuts at the top of the injection nozzles.)
Fuel is injected.
No fuel injection
Check to see if preheating system is functioning properly.
No good
Check following parts. 1. Glow plug relay 2. Preheating timer
Good
Check to see if glow plug is functioning properly.
No good
Defective glow plug
Good
Check to see if injection timing is proper.
No good
Adjust injection timing.
Good
Check to see if fuel injection nozzle is functioning properly.
No good
Defective fuel injection nozzle
Good
Fuel leakage at injection pipe section
No good
Retighten or replace pipe
Check to see if fuel cut solenoid is functioning properly.
No good
With main switch turned ON, check to see if voltage is applied to fuel cut solenoid.
Voltage is applied.
Defective fuel cut solenoid
Good
No voltage is applied.
Check to see if pump is full of fuel.
No good
1. Defective fuse 2. Defective main switch
Good
Check to see if fuel is leaking from distributor head bolt.
No good
1. Air is sucked or fuel is leaking from fuel inlet hose joint section and fuel filter. 2. Fuel filter clogged
Good
Malfunctioning injection pump
Tighten distributor head bolt or replace washer.

IC12000B F

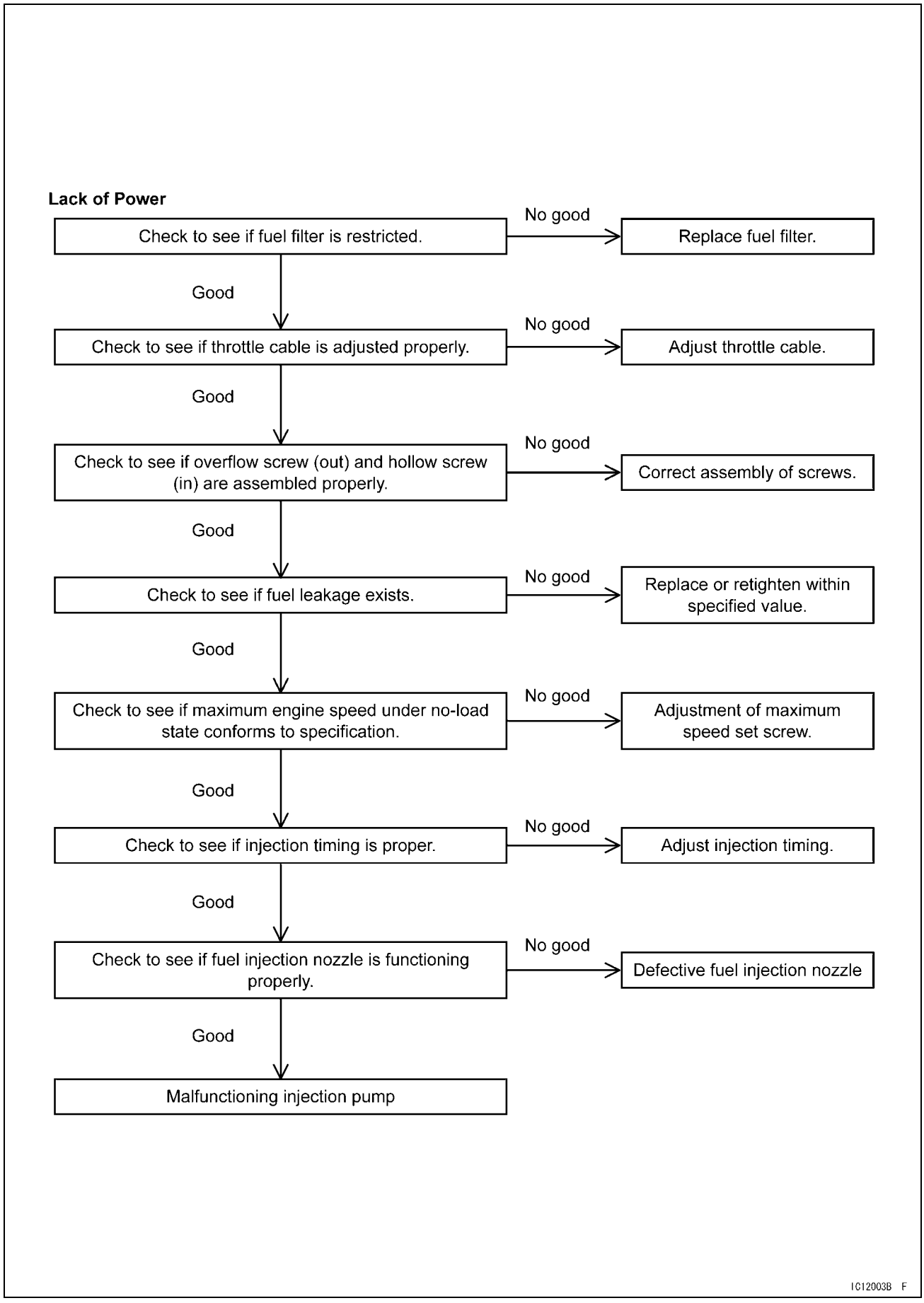
Fuel Injection Pump Troubleshooting


Unstable Idling
Check to see if throttle cable is adjusted properly.
No good
Adjust throttle cable.
Good
Check to see if idling speed is too low.
No good
Adjust idling speed.
Good
Check to see if air is sucked from fuel inlet hose joint section and fuel filter.
No good
Retighten hose joint section, fuel cartridge, drain cap and vent plug.
Good
Check to see if fuel is leaking.
No good
Replace or retighten within specified value.
Good
Check to see if fuel filter is contained water.
No good
Drain water from fuel filter and tank.
Good
Check to see if fuel injection nozzle is functioning properly.
No good
Defective fuel injection nozzle
Good
Check to see if injection timing is proper.
No good
Adjust injection timing.
Good
Malfunctioning injection pump
1C12001B F

Fuel Injection Pump Troubleshooting

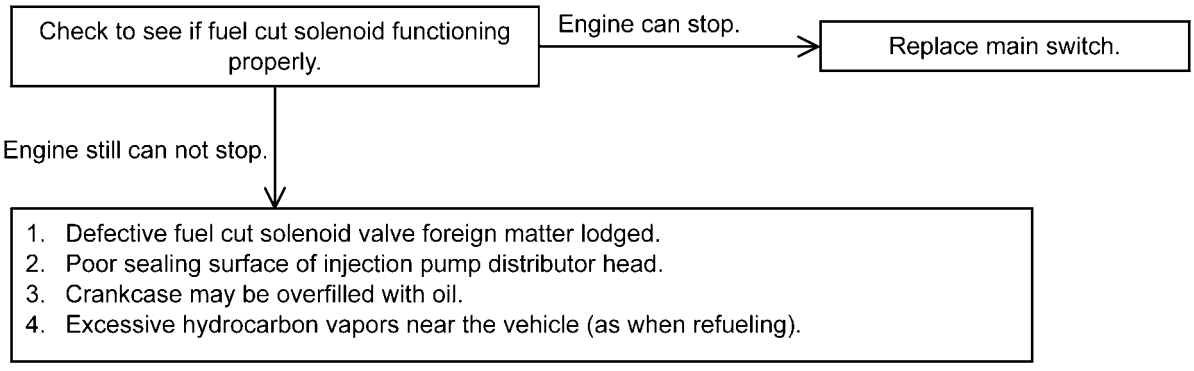

Engine Stalling
Check to see if engine can start again.
Can not start
See section under "Hard Starting".
Can restart
Check to see if idling is stable.
Unstable
See section under "Unstable Idling".
Stable
Check to see if idling speed conforms to specification.
No good
Adjust idling speed.
Good
Check to see if fuel cut solenoid is functioning properly.
No good
With main switch turned ON, check to see if voltage is applied to fuel cut solenoid.
Voltage is applied.
Defective fuel cut solenoid
No voltage is applied.
1. Defective fuse
2. Defective main switch
Good
Check to see if pump is full of fuel.
No good
1. Air is sucked or fuel is leaking from fuel inlet hose joint section and fuel filter.
2. Fuel filter clogged
Good
Check to see if fuel filter is contained water.
No good
Drain water from fuel filter and tank.
Good
Malfunctioning injection pump
ICI2002B F

Fuel Injection Pump Troubleshooting

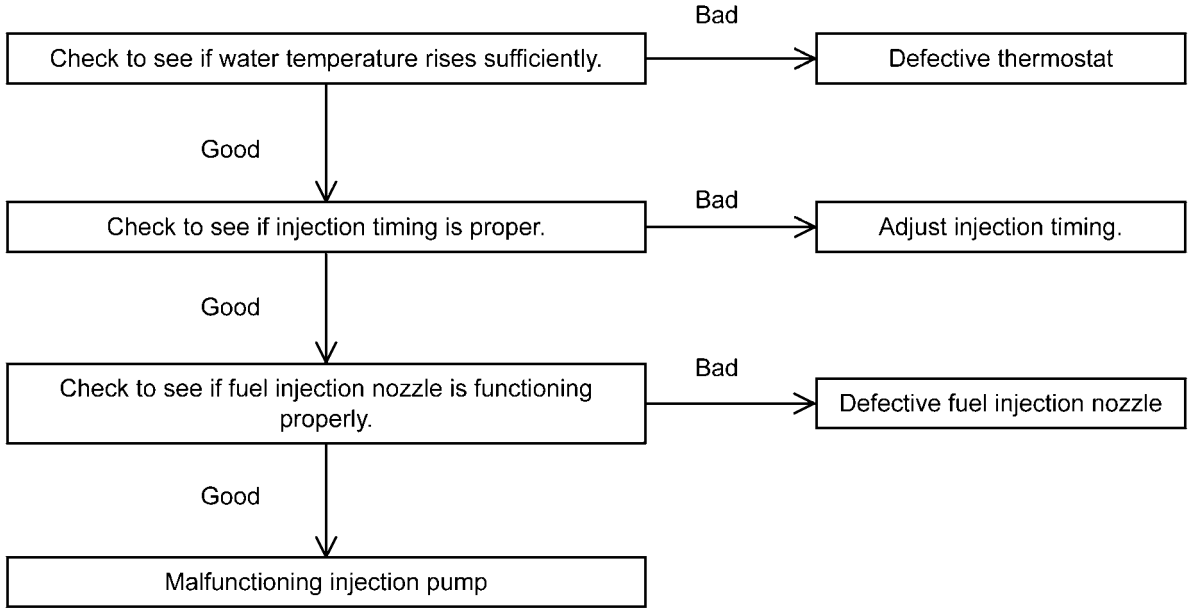

Lack of Power
Check to see if fuel filter is restricted.
No good
Replace fuel filter.
Good
Check to see if throttle cable is adjusted properly.
No good
Adjust throttle cable.
Good
Check to see if overflow screw (out) and hollow screw (in) are assembled properly.
No good
Correct assembly of screws.
Good
Check to see if fuel leakage exists.
No good
Replace or retighten within specified value.
Good
Check to see if maximum engine speed under no-load state conforms to specification.
No good
Adjustment of maximum speed set screw.
Good
Check to see if injection timing is proper.
No good
Adjust injection timing.
Good
Check to see if fuel injection nozzle is functioning properly.
No good
Defective fuel injection nozzle
Good
Malfunctioning injection pump
ICI2003B F

Fuel Injection Pump Troubleshooting

Engine will not stop even after main switch is turned OFF.

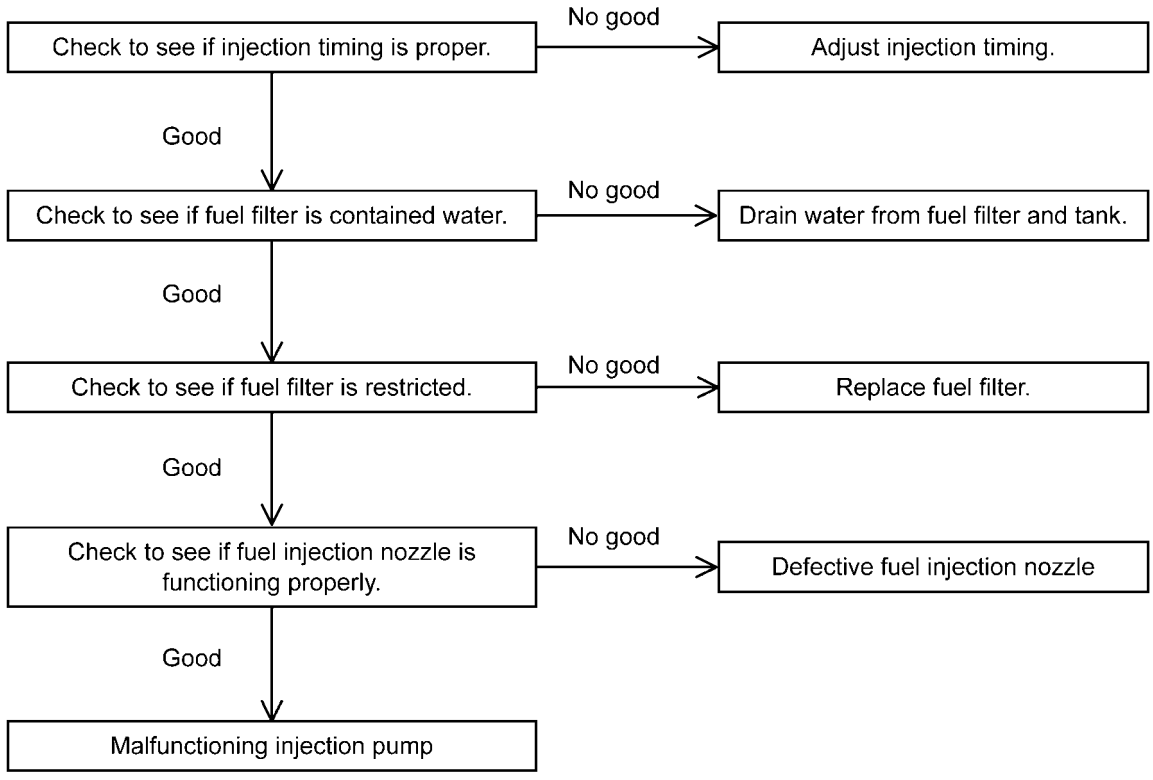

Check to see if fuel cut solenoid functioning properly.
Engine can stop.
Replace main switch.
Engine still can not stop.
1. Defective fuel cut solenoid valve foreign matter lodged.
2. Poor sealing surface of injection pump distributor head.
3. Crankcase may be overfilled with oil.
4. Excessive hydrocarbon vapors near the vehicle (as when refueling).

Abnormal Noise

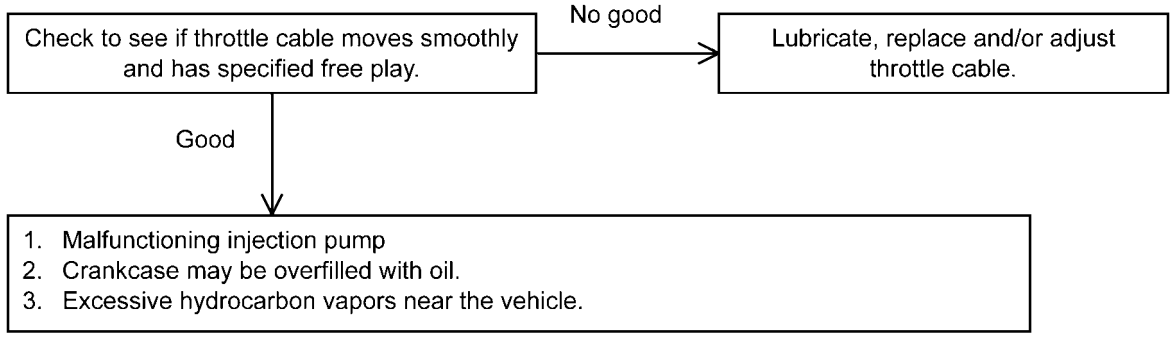


Fuel Injection Pump Troubleshooting

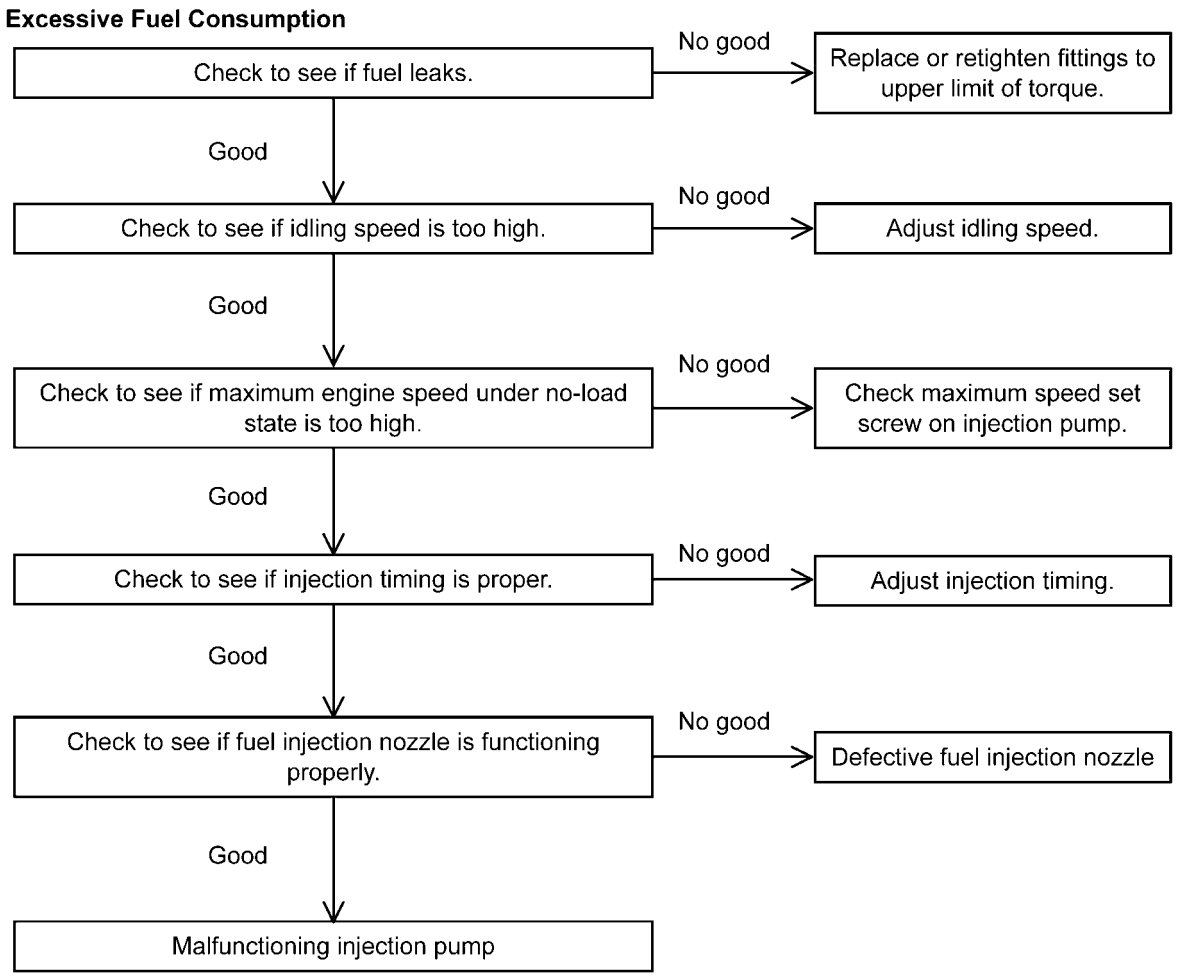
Excessive Exhaust Smoke



Engine keeps racing.


Check to see if throttle cable moves smoothly and has specified free play.
No good
Lubricate, replace and/or adjust throttle cable.
Good
1. Malfunctioning injection pump
2. Crankcase may be overfilled with oil.
3. Excessive hydrocarbon vapors near the vehicle.

Fuel Injection Pump Troubleshooting


Excessive Fuel Consumption
Check to see if fuel leaks.
No good
Replace or retighten fittings to upper limit of torque.
Good
Check to see if idling speed is too high.
No good
Adjust idling speed.
Good
Check to see if maximum engine speed under no-load state is too high.
No good
Check maximum speed set screw on injection pump.
Good
Check to see if injection timing is proper.
No good
Adjust injection timing.
Good
Check to see if fuel injection nozzle is functioning properly.
No good
Defective fuel injection nozzle
Good
Malfunctioning injection pump

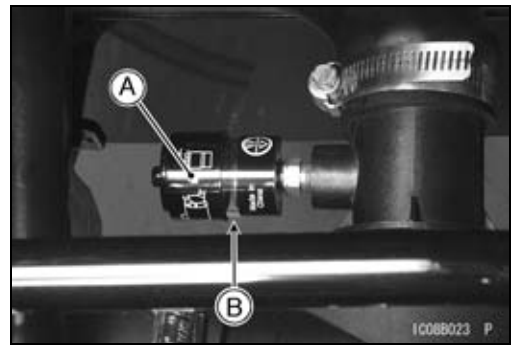
IC12006B F

Air Cleaner

A clogged engine air cleaner restricts the engine's air inlet, increasing fuel consumption, reduction engine power.

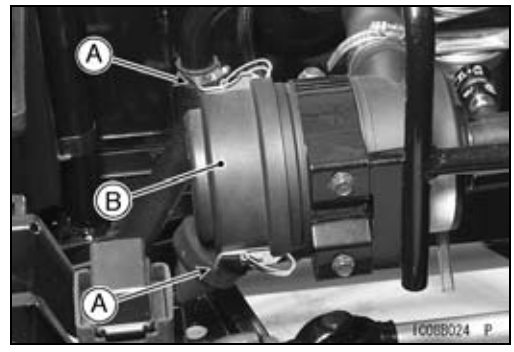
CAUTION
A clogged air cleaner may allow dirt and dust to enter the engine causing excessive wear and possible engine damage.

The engine air filter restriction gauge [A] shows whether the air cleaner is clogged. Whenever the red band shows in the gauge window [B], the air cleaner element should be cleaned.



Air Cleaner Element Cleaning

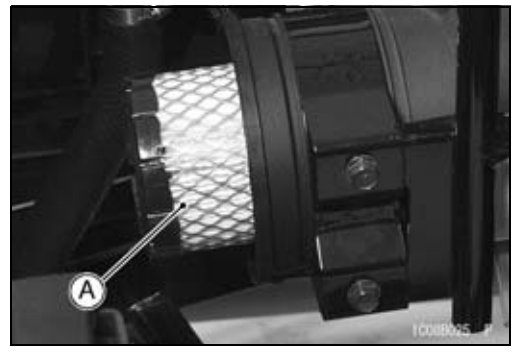
- Tilt up the seat.
- Unlock the clamps [A].
- Remove the air cleaner cover [B].



- Remove the element [A].
- Clean the element by tapping gently with the handle end of a screwdriver.

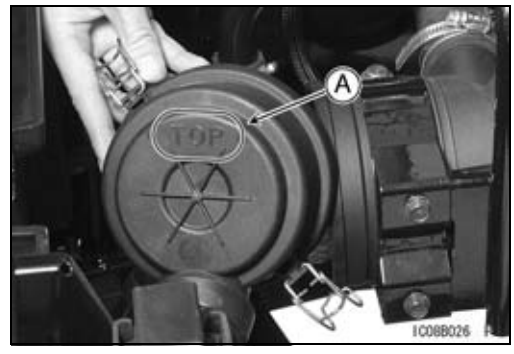
★If the element is very dirty or damaged, replace the element.

- Carefully clean out the air cleaner cover.



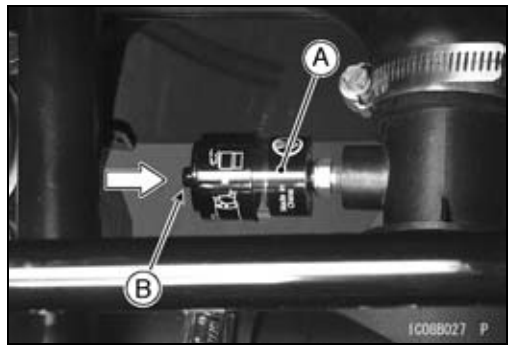
- Install the cover and lock the clamps.

○Face the TOP mark [A] upward.



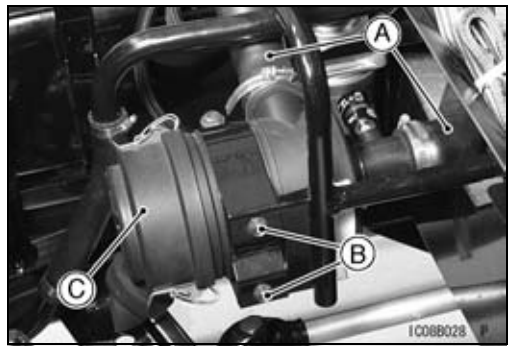
Air Cleaner

● Reset the air filter restriction gauge [A].
○After servicing the air cleaner element, the restriction gauge should be reset by pushing the button [B] at the end of the gauge.



Air Cleaner Housing Removal

● Tilt up the seat.
● Remove:
Air Ducts [A]
Air Cleaner Housing Mounting Bolts [B]
Air Cleaner Housing [C]



Air Cleaner Housing Dust and/or Water Inspection

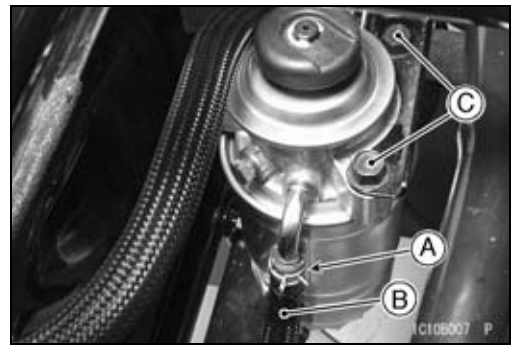
● Push open the drain tube [A] on the bottom of the air cleaner housing.



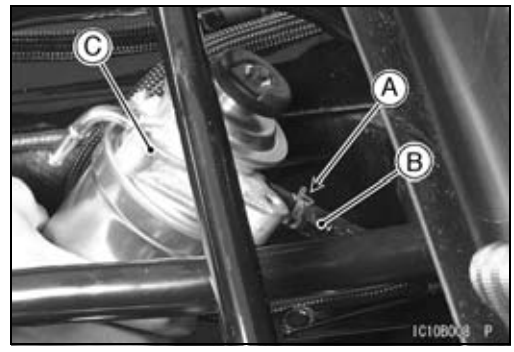
Fuel Filter

Fuel Filter Removal

- Tilt up the seat.
- Remove:
  Clamp [A]
  Fuel Hose [B]
  Fuel Filter Mounting Bolts [C]



- Remove:
  Clamp [A]
  Fuel Hose [B]
  Fuel Filter [C]



Fuel Filter Installation

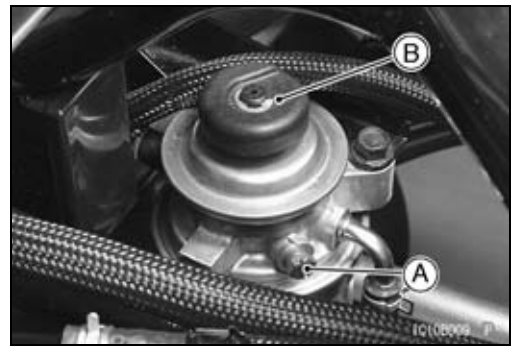
- Install:
  Fuel Filter
  Fuel Hoses (see Cable, Wire, and Hose Routing section in the Appendix chapter)
- Tighten:

Torque - Fuel Filter Mounting Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)

- Bleed the air from the fuel filter.
  ○Loosen the air vent plug [A].
  ○Pump the priming button [B] until the fuel comes out of the air vent.
  ○Tighten the air vent plug securely.

Torque - Air Vent Plug: 5.0 N·m (0.51 kgf·m, 44 in·lb)

  ○Wipe up any spilled fuel.
- Start the engine, and check for fuel leakage.



Fuel Filter Cartridge Replacement

- Refer to the Fuel Filter Element Replacement in the Periodic Maintenance chapter.

Water Draining

- Refer to the Fuel Filter Water Draining in the Periodic Maintenance chapter.

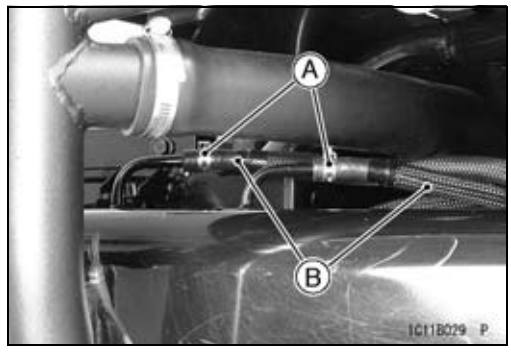
Fuel Tank

Fuel Tank Removal

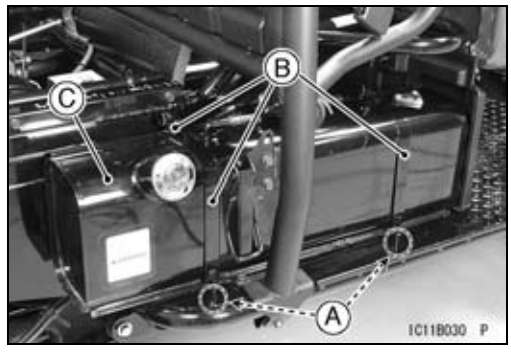
⚠ WARNING

Fuel is extremely flammable and can be explosive under certain conditions. Turn the main switch OFF. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

- Tilt up the cargo bed.
- Remove:
  Clamps [A]
  Fuel Hoses [B]

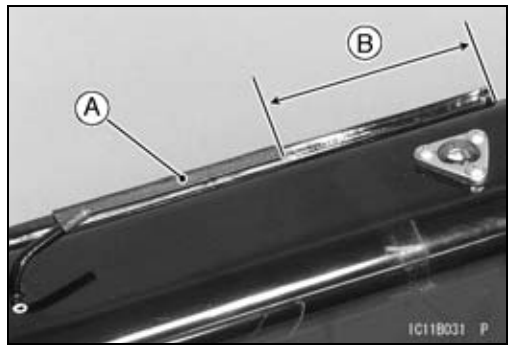


- Remove:
  Holder Nuts [A]
  Fuel Tank Holders [B]
  Fuel Tank [C]



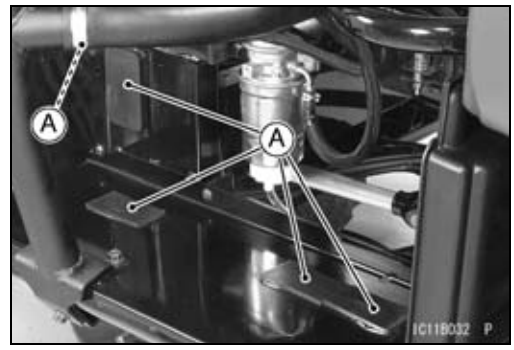
Fuel Tank Installation

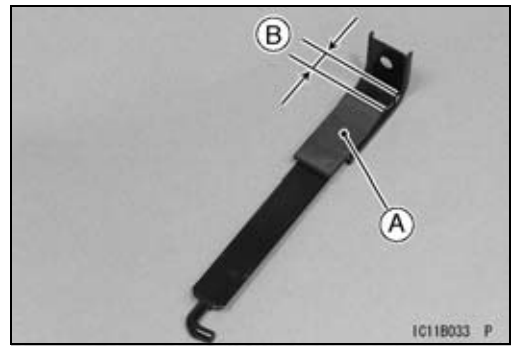
- Check that the trim [A] is in place on the fuel tank.
  168 ~ 178 mm (6.61 ~ 7.01 in.) [B]



Fuel Tank

- Check that the dampers [A] are in place on the frame and holder.
  15 mm (0.60 in.) [B]





- Run the fuel hoses and air vent hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

Fuel Tank Cleaning/Inspection

⚠ WARNING

Clean the tank in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvents to clean the tank.

- Remove the fuel tank and drain it.
- Remove the fuel level gauge (see Fuel Level Gauge Removal).
- Pour some high-flash point solvent into the fuel tank and shake the tank to remove dirt and fuel deposits.
- Pour the solvent out of the tank.
- Dry the tank with compressed air.
- Visually inspect the following items for any damage.
  Fuel Tank Cap Gasket
  Fuel Level Gauge Gasket

★Replace the gaskets if they are damaged.

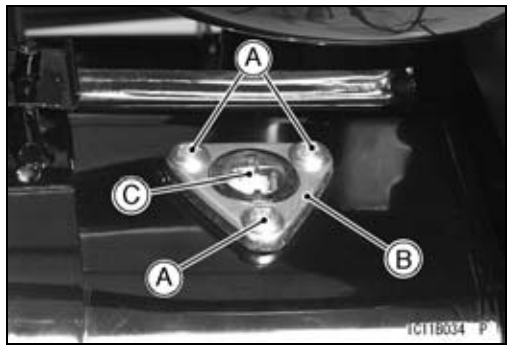
Fuel Level Gauge Removal

⚠ WARNING

Fuel is extremely flammable and can be explosive under certain conditions. Turn the main switch OFF. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

Fuel Tank

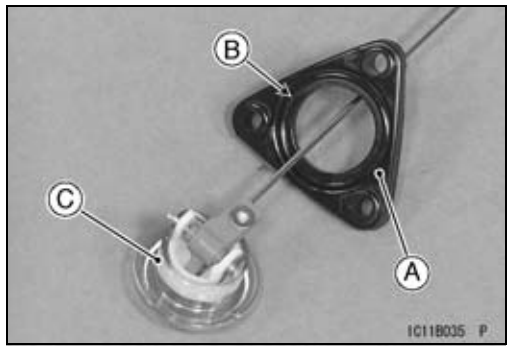
● Remove:
Screws [A]
Holder [B]
Fuel Level Gauge [C]



Fuel Level Gauge Installation

⚠ WARNING

Fuel is extremely flammable and can be explosive under certain conditions. Turn the main switch OFF. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.



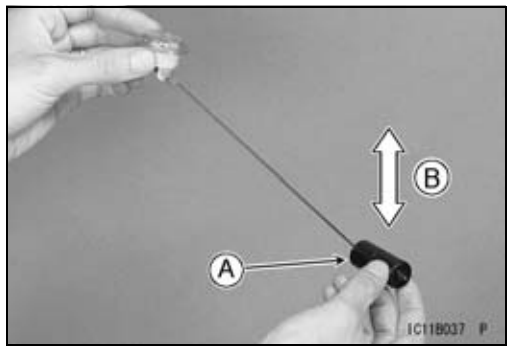
● Visually inspect the gasket [A] for any damage.
★Replace the gasket if it is damaged.
○Install the new gasket so that the stepped side [B] faces gauge [C].

● Align the groove [A] of the holder to the projection [B] of the gauge.
● Tighten the screws securely.



Fuel Level Gauge Check

● Remove the fuel level gauge from the fuel tank (see Fuel Level Gauge Removal).
● Check that the float [A] moves up and down [B] smoothly without binding. It should go down under its own weight.
★If the float does not move smoothly or has visual damage, replace the gauge.

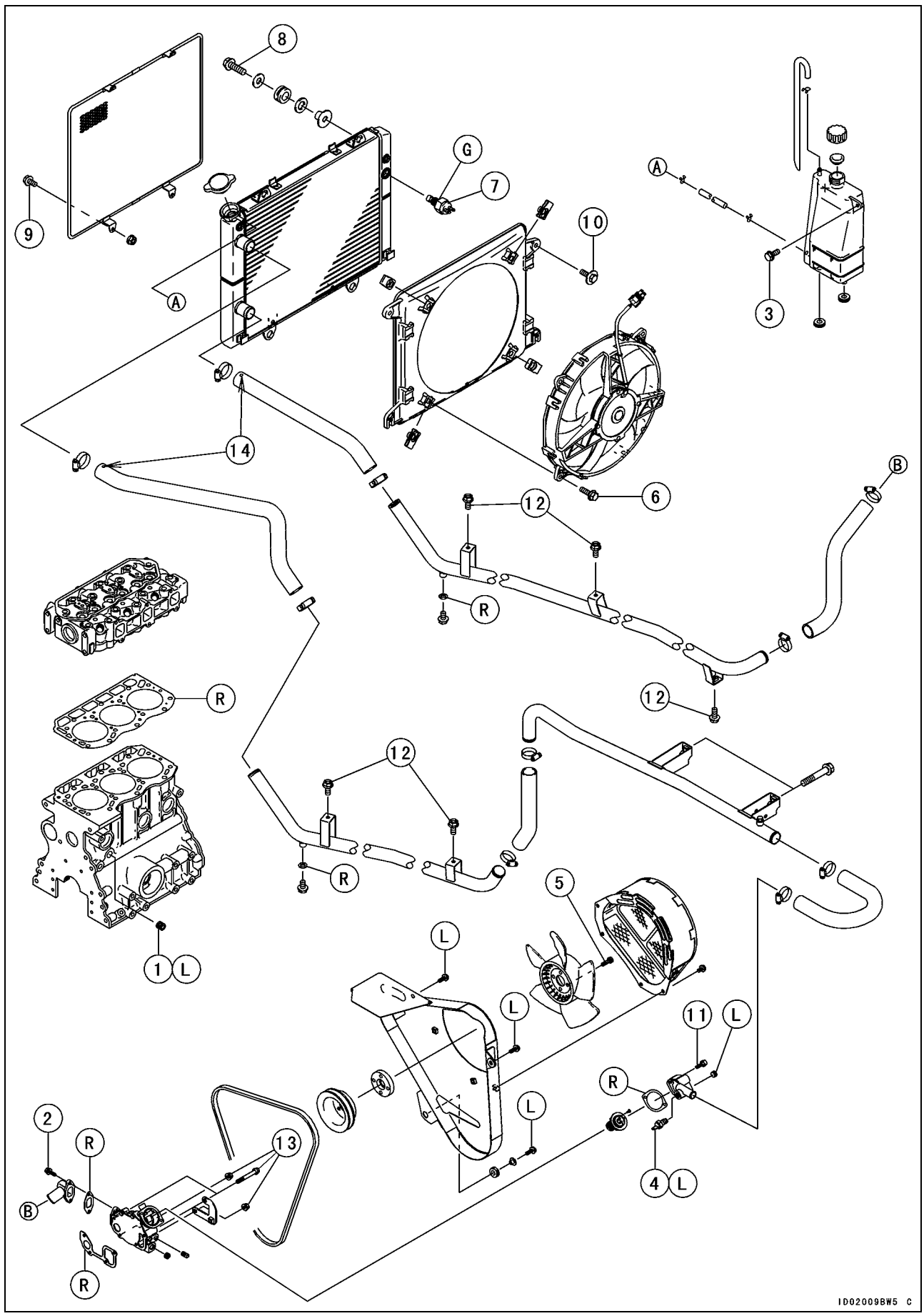


Cooling System

Table of Contents

Exploded View 4-2
Specifications 4-4
Flow Chart 4-5
Coolant 4-6
Coolant Level Inspection 4-6
Coolant Draining 4-6
Coolant Filling 4-6
Water Pump 4-7
Water Pump Removal 4-7
Water Pump Installation 4-7
Water Pump Inspection 4-8
Radiator and Radiator Fan 4-9
Radiator Removal 4-9
Radiator Installation 4-10
Radiator Fan Removal 4-10
Radiator Fan Installation 4-10
Radiator Inspection 4-11
Radiator Cleaning 4-11
Radiator Cap Inspection 4-11
Thermostat 4-12
Thermostat Removal 4-12
Thermostat Installation 4-12
Thermostat Inspection 4-12
Hoses and Pipes 4-13
Hose and Pipe Installation 4-13
Hose Inspection 4-13
Radiator Fan Switch, Coolant Temperature Switch 4-14
Radiator Fan Switch Removal 4-14
Coolant Temperature Switch Removal 4-14
Radiator Fan Switch, Coolant Temperature Switch Installation 4-14
Radiator Fan Switch Inspection 4-14
Coolant Temperature Switch Inspection 4-14

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Coolant Drain Plug	25	2.5	18	L
2	Coolant Inlet Bolts	7.8	0.80	69 in·lb	
3	Coolant Reserve Tank Bolt	4.4	0.45	39 in·lb	
4	Coolant Temperature Switch	27	2.8	20	L
5	Fan Mounting Bolts	8.8	0.90	78 in·lb	
6	Radiator Fan Mounting Bolts	6.0	0.61	53 in·lb	
7	Radiator Fan Switch	25	2.5	18	
8	Radiator Mounting Bolts	8.8	0.90	78 in·lb	
9	Radiator Screen Mounting Bolts	8.8	0.90	78 in·lb	
10	Shroud Mounting Bolts	6.0	0.61	53 in·lb	
11	Thermostat Housing Cap Bolts	7.8	0.80	69 in·lb	
12	Water Pipe Mounting Bolts	8.8	0.90	78 in·lb	
13	Water Pump Mounting Bolts and Nuts	20	2.0	15	

14. Blue Marks: Install the hoses so that their marks face upwards.
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts

4-4 COOLING SYSTEM

Specifications

Item	Standard
Coolant	
Type (Recommended)	Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)
Color	Green
Mixed Ratio	Soft water 50%, coolant 50%
Freezing Point	–35°C (–31°F)
Total Amount	4.1 L (4.3 US qt)
Radiator Cap	
Relief Pressure	93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 psi)
Thermostat	
Valve Opening Temperature	81 ~ 84°C (178 ~ 183°F)
Valve Full Opening Temperature	95°C (203°F)

Flow Chart

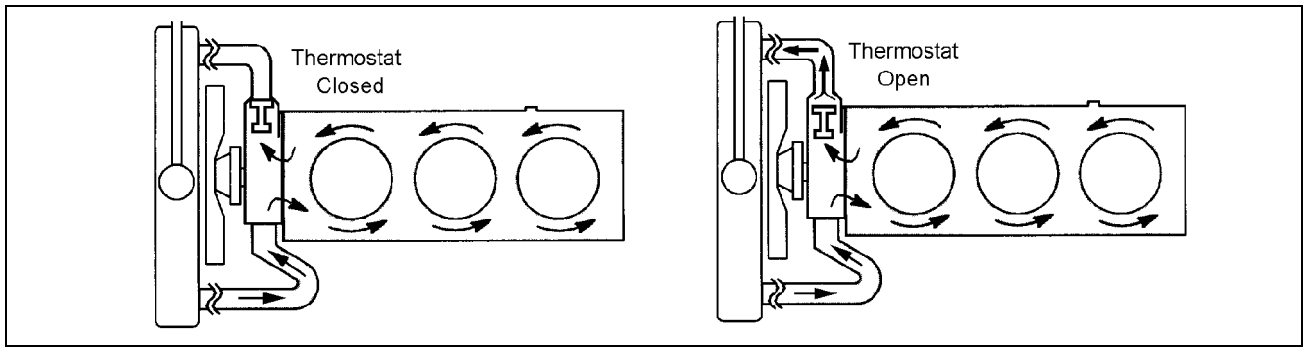
This engine has a pressurized, forced circulation cooling system.

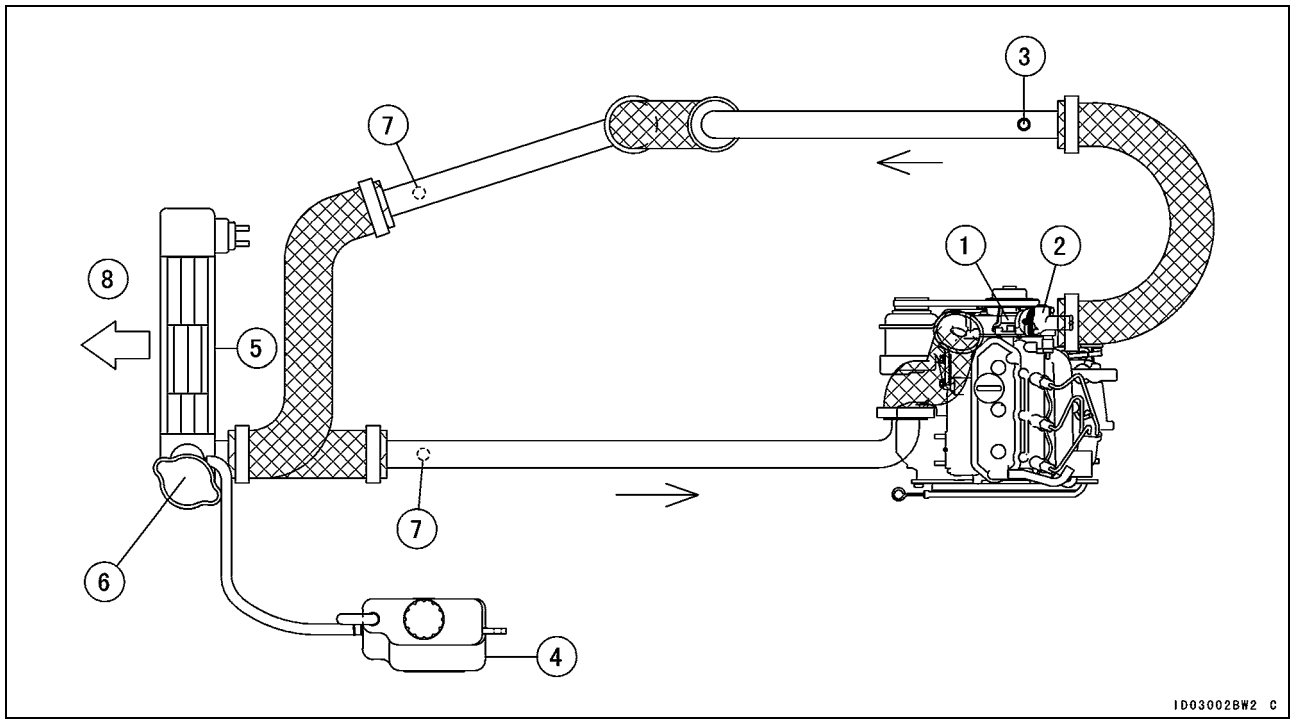
The water pump circulates coolant through the cylinder block, cylinder head and radiator. The thermostat maintains optimum engine temperature.

The thermostat is equipped with a by-pass valve which permits coolant to re-circulate through the cylinder block and cylinder head.

As the engine warms, the by-pass valve closes as the thermostat opens, permitting complete circulation through the radiator.

Always maintain a 50% solution of phosphate free antifreeze at all times for adequate heat dissipation, lubrication and protection from freezing.





1. Water Pump
2. Thermostat
3. Air Bleed Bolt
4. Reserve Tank
5. Radiator
6. Radiator Cap
7. Drain Bolts
8. Front

Coolant

Coolant Level Inspection

NOTE

○*Check the level when the engine is cold (room of ambient temperature).*

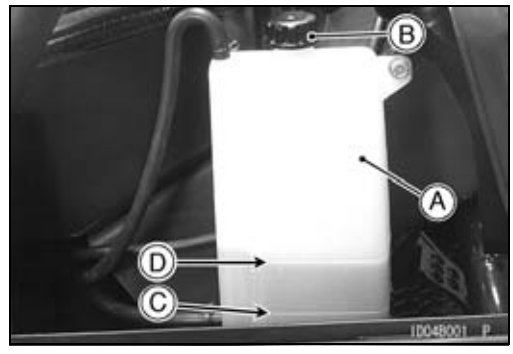
CAUTION

Do not check the level through the coolant filler by removing the radiator cap. If the cap is removed, the coolant will flow out from the reserve tank.

● Open the front cargo hood.

● Check the coolant level in the reserve tank [A] with the vehicle parked on a level surface.

★ If the coolant level is lower than the L (Low) level line [C], remove the reserve tank cap [B], then add coolant to the F (Full) level line [D].



CAUTION

For refilling, add the specified mixture of coolant and soft water. Adding water alone dilutes the coolant and degrades its anticorrosion properties. The diluted coolant can attack the aluminum engine parts. In an emergency, soft water can be added. But the diluted coolant must be returned to the correct mixture ratio within a few days.
If coolant must be added often, or the reserve tank has run completely dry; there is probably leakage in the cooling system. Check the system for leaks.

Coolant Draining

● Refer to the Coolant Change in the Periodic Maintenance chapter.

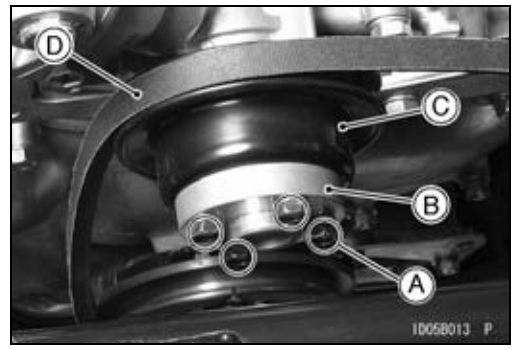
Coolant Filling

● Refer to the Coolant Change in the Periodic Maintenance chapter.

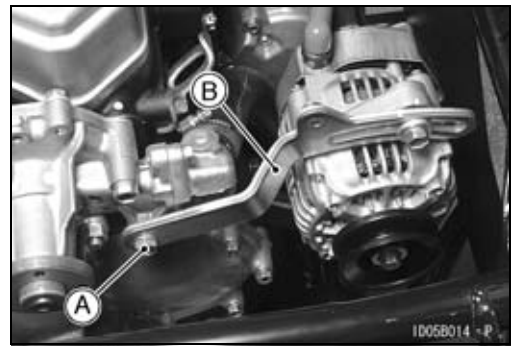
Water Pump

Water Pump Removal

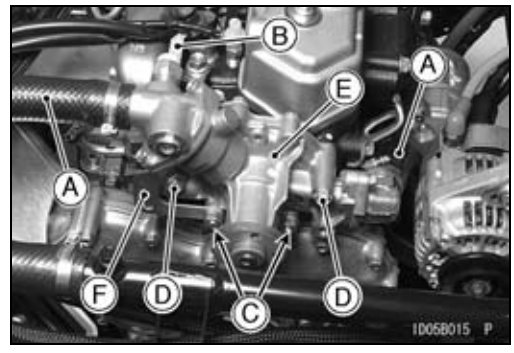
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove the fan belt cover (see Cooling Fan Belt Inspection in the Periodic Maintenance chapter).
- Loosen the cooling fan belt (see Cooling Fan Belt Inspection in the Periodic Maintenance chapter).
- Remove:
  Fan Mounting Bolts [A]
  Spacer [B]
  Water Pump Pulley [C]
  Fan Belt [D]



- Remove the bracket bolt [A], and move the fan belt adjusting bracket [B] forward.



- Remove:
  Water Pump Hoses [A]
  Coolant Temperature Switch Lead Connector [B]
  Water Pump Mounting Nuts [C]
  Water Pump Mounting Bolts [D]
  Water Pump [E] and Bracket [F]



Water Pump Installation

- Replace the water pump gasket with a new one.
- Install the water pump.

Torque - Water Pump Mounting Bolts and Nuts: 20 N·m (2.0 kgf·m, 15 ft·lb)

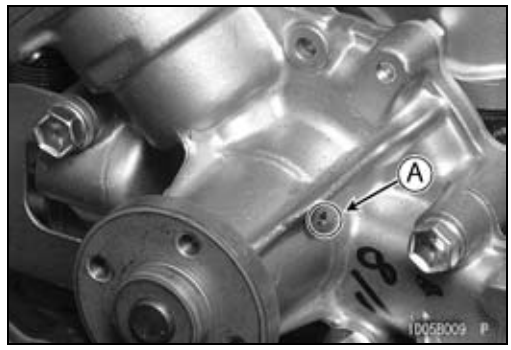
- Tighten:

Torque - Alternator Adjusting Bracket Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)

- Adjust the fan belt deflection (see Cooling Fan Belt Inspection in the Periodic Maintenance chapter).

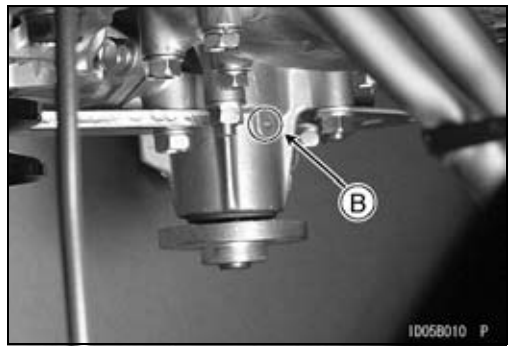
Water Pump

Water Pump Inspection



- Check the drainage outlet passage at the top [A] and bottom [B] of the water pump body for coolant leakage.

★If the mechanical seal is damaged, the coolant leaks through the seal and drains through the passages. Replace the water pump unit.



- Remove the water pump pulley [A], and check it.

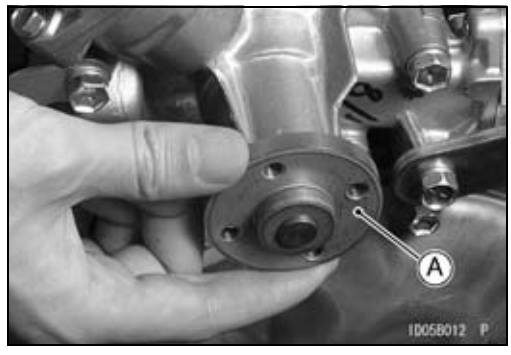
★If the pulley is bent or damaged, replace the pulley.



- Check the water pump bearings by rotating pulley flange [A] by hand.

○Make sure pulley rotates smoothly.

★If the water pump shows evidence of the bearings are rough, replace the water pump unit.



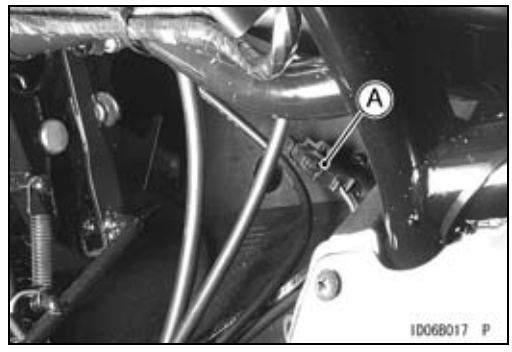
Radiator and Radiator Fan

Radiator Removal

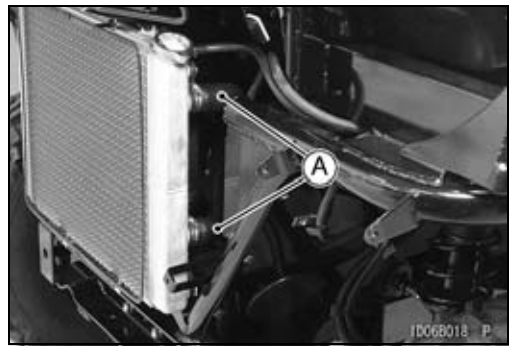
⚠ WARNING

The radiator fan is connected directly to the battery through the fan switch and relay. The radiator fan may start even if the main switch is off. NEVER TOUCH THE RADIATOR FAN UNTIL THE RADIATOR FAN CONNECTOR IS DISCONNECTED. TOUCHING THE FAN BEFORE THE CONNECTOR IS DISCONNECTED COULD CAUSE INJURY FROM THE FAN BLADES.

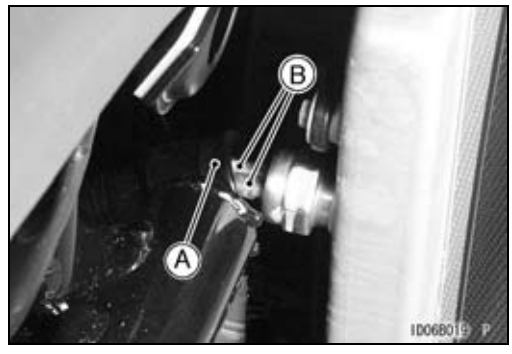
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Front Cover (see Front Cover Removal in the Frame chapter)
  Radiator Fan Lead Connector [A]



- Remove the water hoses [A].



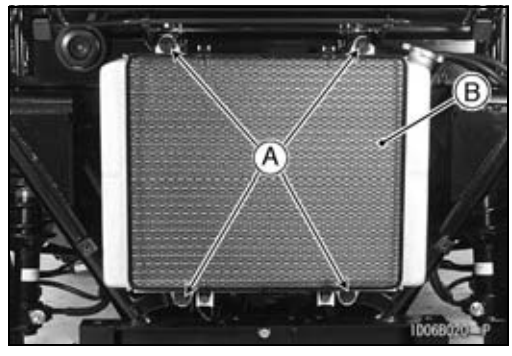
- Turn over the rubber cover [A].
- Disconnect the radiator fan switch lead connectors [B].



- Remove:
  Radiator Mounting Bolts [A]
  Radiator with Screen [B]

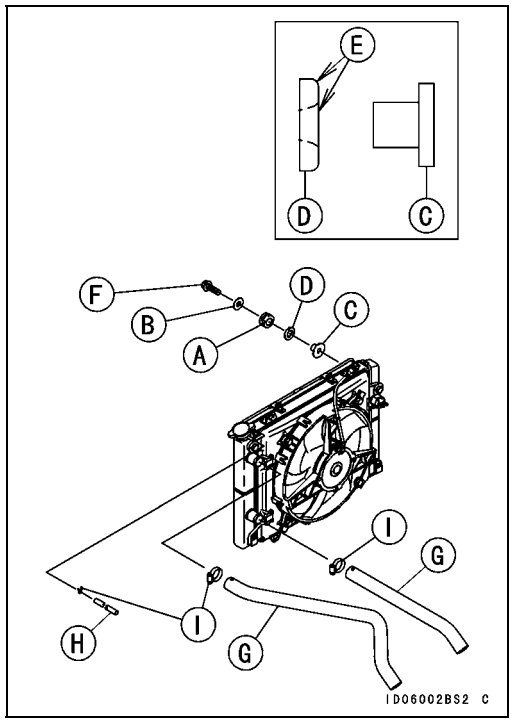
CAUTION

Do not touch the radiator core. This could damage the radiator fins, resulting in loss of cooling efficiency.



Radiator and Radiator Fan

Radiator Installation



- Install:
  Dampers [A]
  Washers [B]
  Collars [C]
  Washers [D]

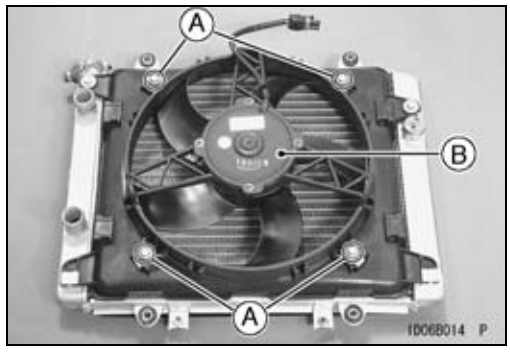
○Install the washers [D] so that the round side [E] faces to the collar [C].

- Tighten:

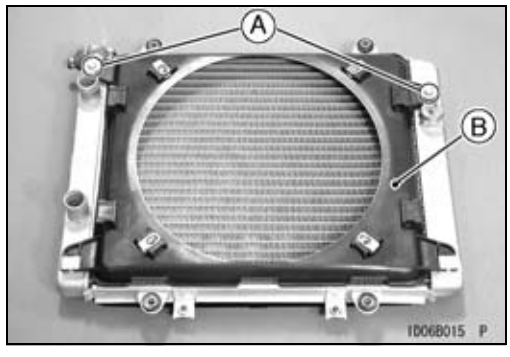
Torque - Radiator Mounting Bolts [F]: 8.8 N·m (0.90 kgf·m, 78 in·lb)

- Connect:
  Radiator Fan Switch Lead Connectors
  Radiator Fan Lead Connector
- Install:
  Radiator Hoses [G]
  Reserve Tank Hose [H]
  Clamps [I]
- Run the hoses according to the Cable, Wire, and Hose Routing section in the Appendix chapter.

Radiator Fan Removal

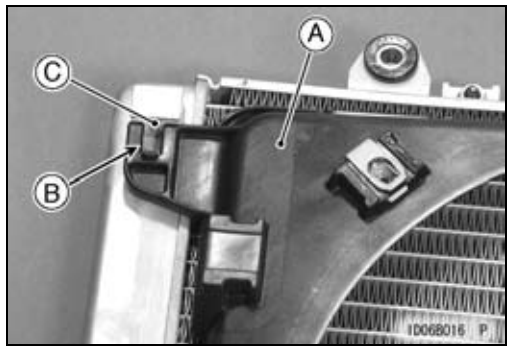


- Remove:
  Radiator
  Radiator Fan Mounting Bolts [A]
  Radiator Fan Assembly [B]



- Remove:
  Shroud Mounting Bolts [A]
  Shroud [B]

Radiator Fan Installation



- Install the shroud [A] so that the recess [B] of the shroud fit on the stopper [C] of the radiator.
- Tighten:

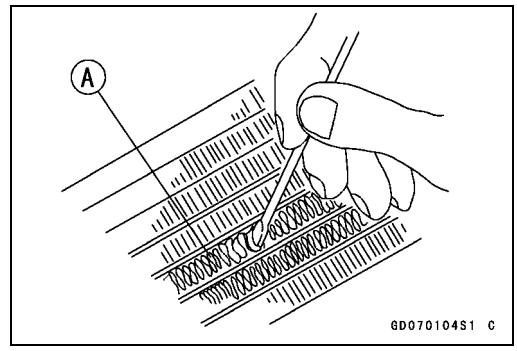
Torque - Shroud Mounting Bolts: 6.0 N·m (0.61 kgf·m, 53 in·lb)

- Install:
  Radiator Fan Assembly
  Radiator Fan Mounting Bolts
- Tighten:

Torque - Radiator Fan Mounting Bolts: 6.0 N·m (0.61 kgf·m, 53 in·lb)

Radiator and Radiator Fan

Radiator Inspection



- Check the radiator core.

★If there are obstructions to air flow, remove them.

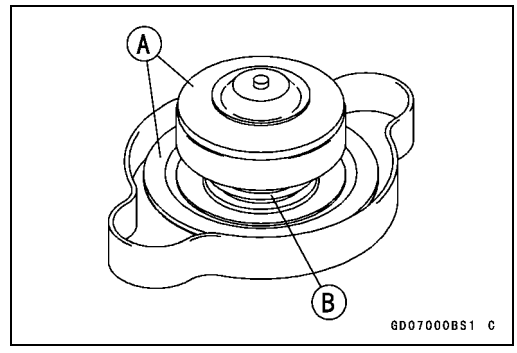
★If the corrugated fins [A] are deformed, carefully straighten them.

★If the air passages of the radiator core are blocked more than 20% by unremovable obstructions or irreparable deformed fins, replace the radiator.

Radiator Cleaning

- Refer to the Radiator Cleaning in the Periodic Maintenance chapter.

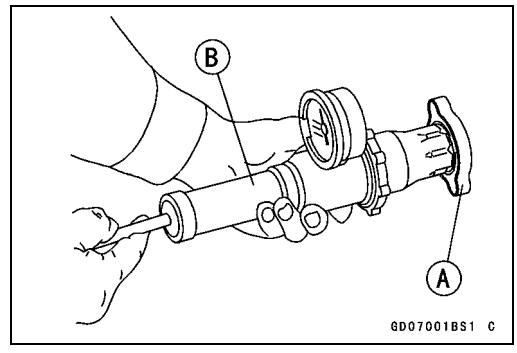
Radiator Cap Inspection



- Check the condition of the radiator cap valve seals [A] and valve spring [B].

★If any one of them shows visible damage, replace the cap with a new one.

- Install the cap [A] on a cooling system pressure tester [B].



NOTE

○*Wet the cap sealing surfaces with water or coolant to prevent pressure leakage.*

- Watching the pressure gauge, slowly pump the pressure tester to build up the pressure. The gauge pointer must remain within the relief pressure range in the table below at least 6 seconds. Continue to pump the tester until the relief valve opens, indicated by the gauge pointer flicking downward. The relief valve must open within the specified range.

Radiator Cap Relief Pressure

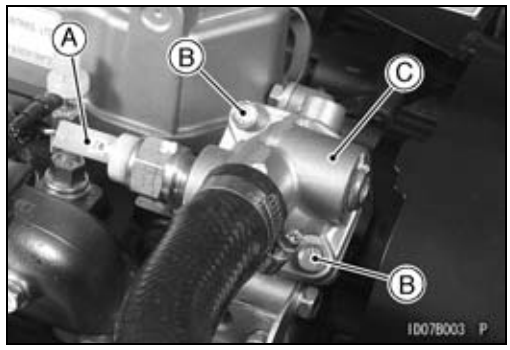
Standard:	**93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 psi)**

★If the cap cannot hold the specified pressure, or if it holds too much pressure, replace the cap.

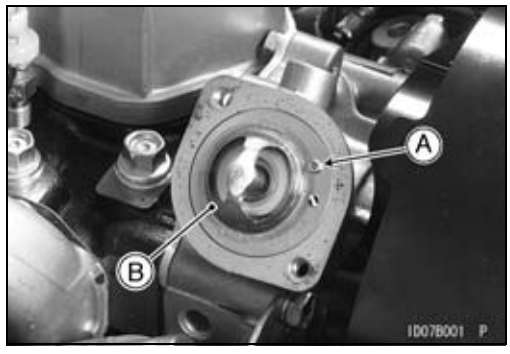
Thermostat

Thermostat Removal

- Tilt up the cargo bed.
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Coolant Temperature Switch Lead Connector [A]
  Thermostat Housing Cap Bolts [B]
  Thermostat Housing Cap [C]



- Remove:
  Locating Screw [A]
  Thermostat [B]



Thermostat Installation

- Replace the thermostat housing gasket with a new one.
- Install the locating screw.
- Tighten:

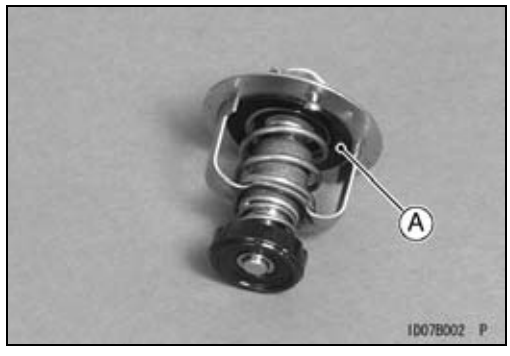
Torque - Thermostat Housing Cap Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)

- Adjust the coolant (see Coolant Change in the Periodic Maintenance chapter).

Thermostat Inspection

- Remove the thermostat, and inspect the thermostat valve [A] at room temperature.

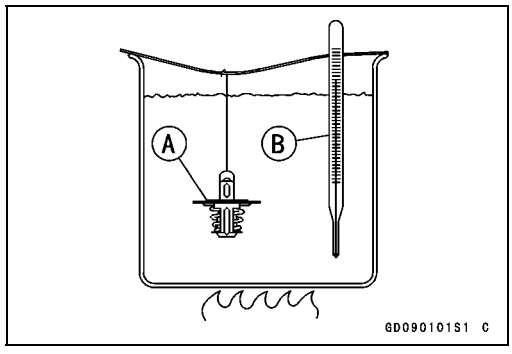
★If the valve is open, replace the thermostat with a new one.



- To check valve opening temperature, suspend the thermostat [A] in a container of water and raise the temperature of the water.

○The thermostat must be completely submerged and must not touch the container sides or bottom. Suspend an accurate thermometer [B] in the water. It must not touch the container, either.

★If the measurement is out of the specified range, replace the thermostat with a new one.



Thermostat Valve Opening Temperature
Standard: 81 ~ 84°C (178 ~ 183°F)

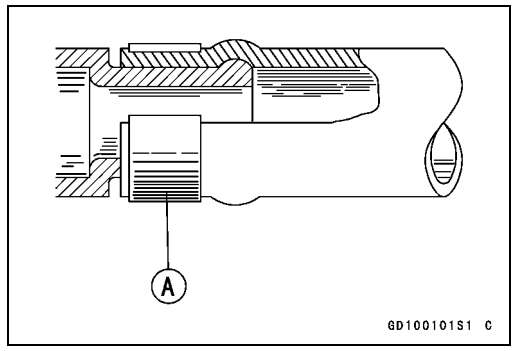
Thermostat Valve Full Opening Temperature
Standard: 95°C (203°F)

Hoses and Pipes

Hose and Pipe Installation

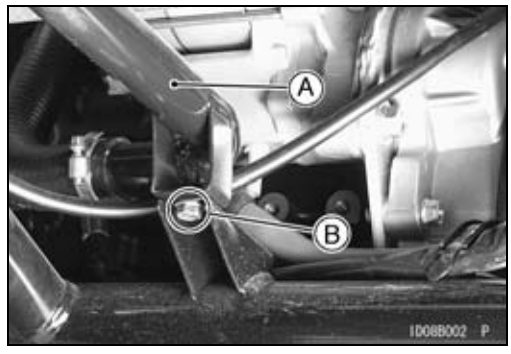
- Install the hoses and pipes being careful to follow bending direction or diameter. Avoid sharp bending, kinking, flattening, or twisting.
- Install the clamps [A] as near as possible to the hose end to clear the raised rib or the fitting. This will prevent the hoses from working loose.

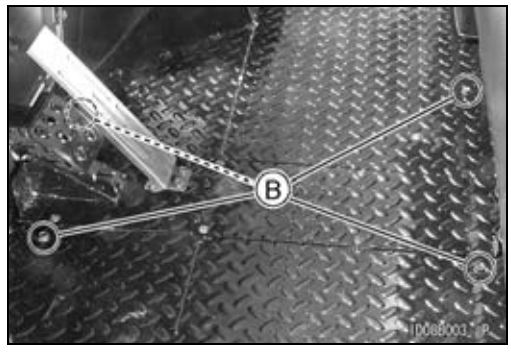
○The clamp screws should be positioned correctly to prevent the clamps from contacting anything.



- Install the water pipes [A].
- Tighten:

Torque - Water Pipe Mounting Bolts [B]: 8.8 N·m (0.90 kgf·m, 78 in·lb)





Hose Inspection

- Refer to the Radiator Hose and Connection Inspection in the Periodic Maintenance chapter.

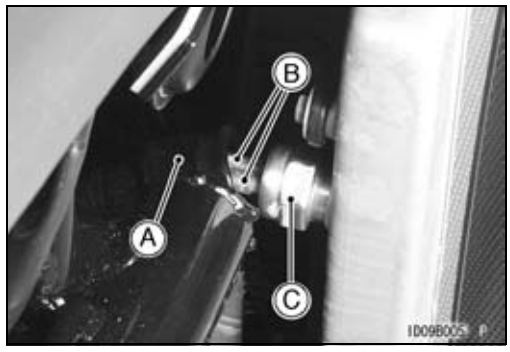
Radiator Fan Switch, Coolant Temperature Switch

Radiator Fan Switch Removal

CAUTION

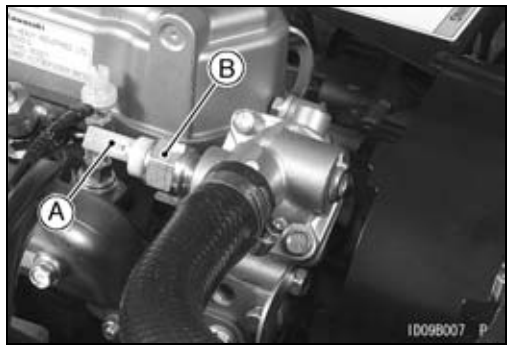
The fan switch or the coolant temperature switch should never be allowed to fall on a hard surface. Such a shock to their parts can damage them.

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove the front cover (see Front Cover Removal in the Frame chapter).
- Turn over the rubber cover [A].
- Remove:
  Radiator Fan Switch Lead Connectors [B]
  Radiator Fan Switch [C]



Coolant Temperature Switch Removal

- Tilt up the cargo bed.
- Remove:
  Coolant Temperature Switch Lead Connector [A]
  Coolant Temperature Switch [B]



Radiator Fan Switch, Coolant Temperature Switch Installation

- Apply grease to the O-ring on the fan switch.
- Apply a non-permanent locking agent to the threads of the coolant temperature switch.
- Tighten the fan switch and coolant temperature switch.

Torque - Radiator Fan Switch: 25 N·m (2.5 kgf·m, 18 ft·lb)
Coolant Temperature Switch: 27 N·m (2.8 kgf·m, 20 ft·lb)

Radiator Fan Switch Inspection

- Refer to the Radiator Fan Switch Inspection in the Electrical System chapter.

Coolant Temperature Switch Inspection

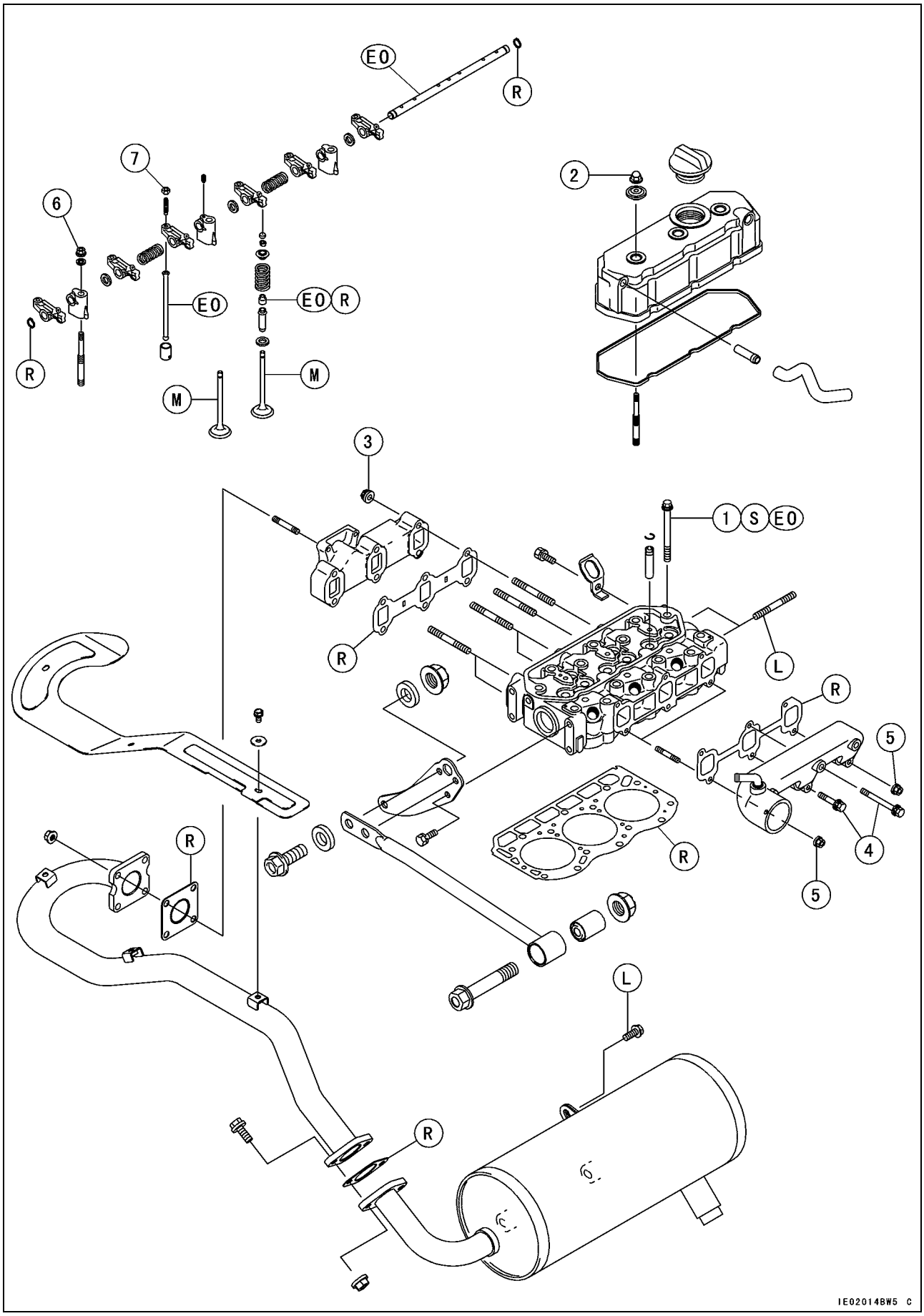
- Refer to the Coolant Temperature Switch Inspection in the Electrical System chapter.

Engine Top End

Table of Contents

Exploded View 5-2
Specifications 5-4
Special Tools 5-5
Cylinder Head 5-7
  Cylinder Compression Measurement 5-7
  Cylinder Head Removal 5-7
  Cylinder Head Installation 5-8
  Cylinder Head Warp 5-9
Rocker Shaft and Rocker Arm 5-10
  Rocker Arm Components Removal 5-10
  Rocker Arm Components Installation 5-10
  Rocker Arm Components Disassembly 5-11
  Rocker Arm Components Assembly 5-11
  Rocker Arm/Shaft Wear 5-11
Valve Lifters 5-13
  Valve Lifter Removal 5-13
  Valve Lifter Installation 5-13
  Valve Lifter Inspection 5-13
Valves 5-14
  Valve Clearance Inspection 5-14
  Valve Clearance Adjustment 5-14
  Valve Removal 5-14
  Valve Installation 5-14
  Valve Guide Removal 5-15
  Valve Guide Installation 5-15
  Valve Seat Inspection 5-15
  Valve Seat Repair 5-16
  Valve Spring Free Length 5-21
  Valve Head Thickness 5-21
  Valve Stem Diameter 5-21
  Valve Guide Inspection 5-21
  Measuring Valve/Guide Clearance 5-22
  Valve Stem Cap Inspection 5-22
Exhaust Pipe and Muffler 5-23
  Exhaust Pipe Removal 5-23
  Muffler Removal 5-23
  Exhaust Pipe and Muffler Installation 5-24
  Exhaust Pipe and Muffler Inspection 5-24
  Spark Arrester Cleaning 5-24

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Cylinder Head Bolts	34	3.5	25	EO, S
2	Cylinder Head Cover Nuts	5.4	0.55	48 in·lb	
3	Exhaust Manifold Mounting Nuts	20	2.0	15	
4	Inlet Manifold Mounting Bolts	7.8	0.80	69 in·lb	
5	Inlet Manifold Mounting Nuts	7.8	0.80	69 in·lb	
6	Rocker Arm Components Mounting Nuts	20	2.0	15	
7	Valve Adjusting Screw Locknuts	11	1.1	97 in·lb	

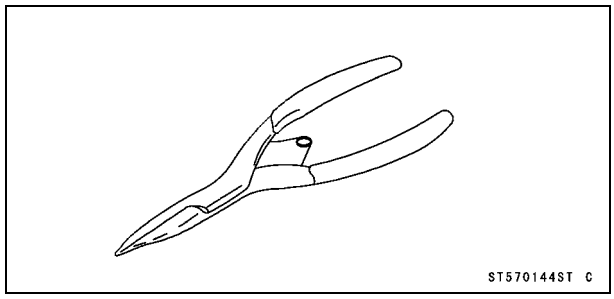
EO: Apply engine oil.
L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
R: Replacement Parts
S: Follow the specified tightening sequence.

Specifications

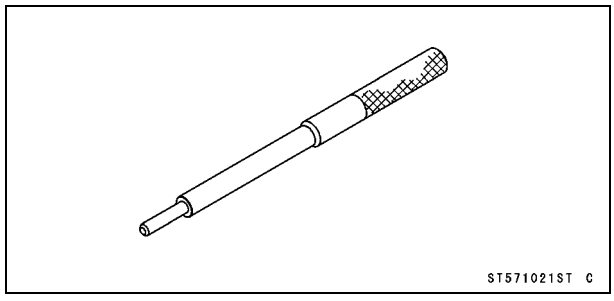
Item	Standard	Service Limit
Cylinder Head		
Cylinder Compression	3 330 kPa (34.0 kgf/cm², 483 psi) at 300 r/min (rpm)	2 990 kPa (30.5 kgf/cm², 434 psi) at 300 r/min (rpm)
Cylinder Head Warp	– – –	0.1 mm (0.004 in.)
Rocker Shaft and Rocker Arm		
Rocker Arm Inside Diameter	10.00 ~ 10.02 mm (0.3937 ~ 0.3945 in.)	10.03 mm (0.3949 in.)
Rocker Shaft Diameter	9.97 ~ 9.99 mm (0.3925 ~ 0.3933 in.)	9.957 mm (0.3920 in.)
Valve Lifters		
Valve Lifter Outside Diameter	17.98 mm (0.7079 in.)	17.91 mm (0.7051 in.)
Valves		
Valve Clearance	0.20 mm (0.0079 in.)	– – –
Valve Seating Surface:		
Width:	0.8 ~ 1.2 mm (0.0315 ~ 0.0472 in.)	– – –
Outside Diameter:		
Inlet	28 mm (1.1024 in.)	– – –
Exhaust	24.5 mm (0.9646 in.)	– – –
Valve Seat Cutting Angle	32°, 45°, 60°	– – –
Valve Spring Free Length	30.7 mm (1.2087 in.)	29.7 mm (1.1693 in.)
Valve Head Thickness	1.2 mm (0.0472 in.)	1.0 mm (0.0394 in.)
Valve Stem Diameter:		
Inlet	5.945 ~ 5.960 mm (0.2341 ~ 0.2346 in.)	5.903 mm (0.2324 in.)
Exhaust	5.965 ~ 5.980 mm (0.2348 ~ 0.2354 in.)	5.923 mm (0.2332 in.)
Valve Guide Inside Diameter	6.000 ~ 6.015 mm (0.2362 ~ 0.2368 in.)	6.036 mm (0.2376 in.)
Valve Guide Outside Diameter:		
Standard Valve Guide	11.05 mm (0.4350 in.)	– – –
Replacement Valve Guide	11.08 mm (0.4362 in.)	– – –
Valve/Guide Clearance:		
Inlet	0.055 ~ 0.070 mm (0.0022 ~ 0.0028 in.)	0.090 mm (0.0035 in.)
Exhaust	0.035 ~ 0.050 mm (0.0014 ~ 0.0020 in.)	0.094 mm (0.0037 in.)

Special Tools

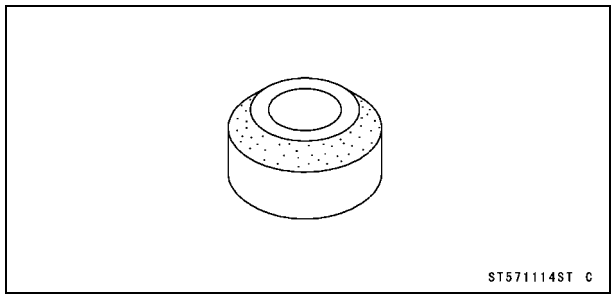
Outside Circlip Pliers:
57001-144



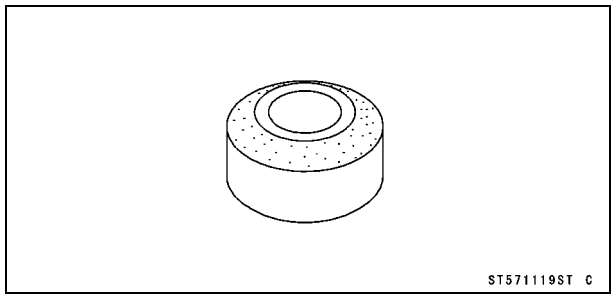
Valve Guide Arbor, ϕ5.5:
57001-1021



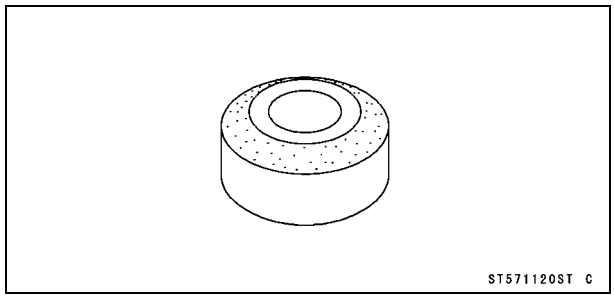
Valve Seat Cutter, 45° - ϕ27.5:
57001-1114



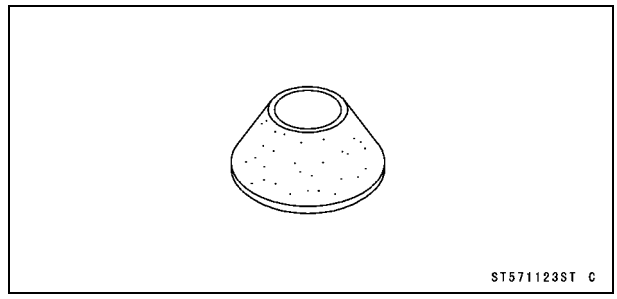
Valve Seat Cutter, 32° - ϕ28:
57001-1119



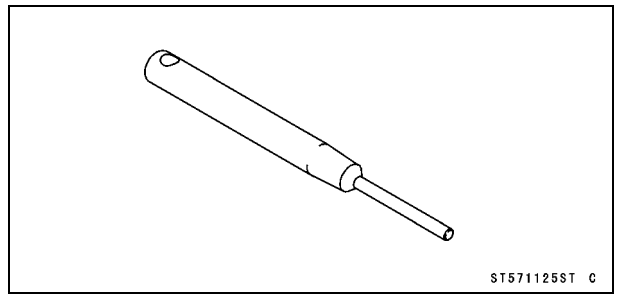
Valve Seat Cutter, 30° - ϕ30:
57001-1120



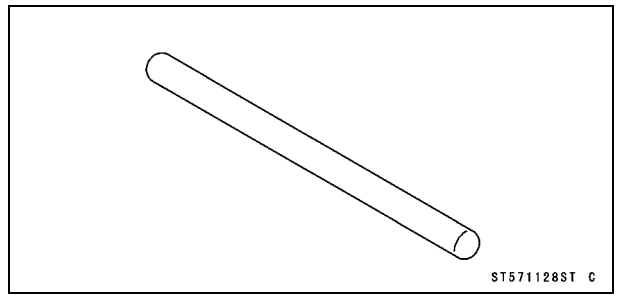
Valve Seat Cutter, 60° - ϕ30:
57001-1123



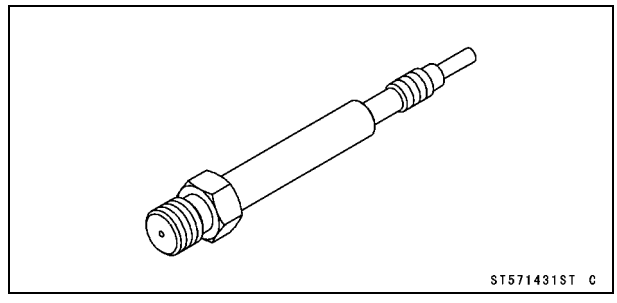
Valve Seat Cutter Holder, ϕ5.5:
57001-1125



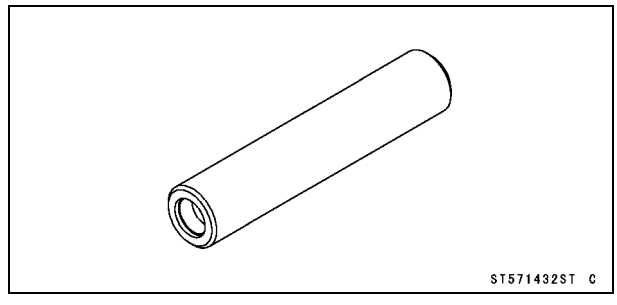
Valve Seat Cutter Holder Bar:
57001-1128



Compression Gauge Adapter:
57001-1431

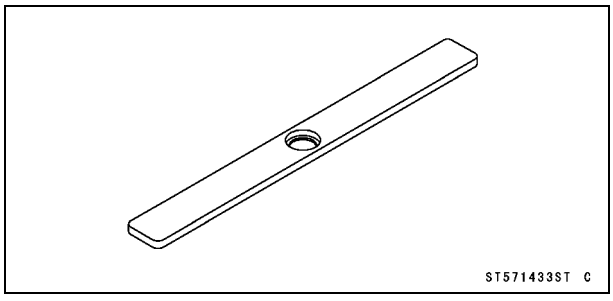


Valve Guide Driver:
57001-1432



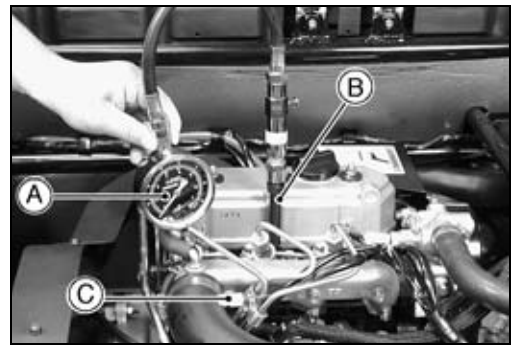
Special Tools

Valve Spring Compressor:
57001-1433



Cylinder Head

Cylinder Compression Measurement



- Tilt up the cargo bed.
- Thoroughly warm up the engine so that the engine oil between the piston and the cylinder wall will help seal compression as it does during normal running.
- Stop the engine, remove the glow plugs, and attach a compression gauge [A] firmly into the one glow plug hole.

Special Tool - Compression Gauge Adapter [B]: 57001 -1431

- Wrap a tape around the glow plug lead (black/white) end to insulate.
- Disconnect the fuel cut solenoid lead connector [C].
- Using the starter motor, turn the engine over until the compression gauge stops rising; this is the highest compression reading obtainable.

Cylinder Compression

Standard: 3 330 kPa (34.0 kgf/cm², 483 psi) at 300 r/min (rpm)

Service Limit: 2 990 kPa (30.5 kgf/cm², 434 psi) at 300 r/min (rpm)

- Repeat the measurement for the other cylinders.

○The following table should be consulted if the obtainable compression reading is not within the specific range.

Problem	Diagnosis	Remedy (Action)
Cylinder compression is higher than standard.	Carbon accumulation on piston and cylinder head, and in combustion chamber possibly due to damaged valve stem oil seal and/or damaged piston oil rings.	Remove the carbon deposits and replace damaged parts.
	Incorrect cylinder head gasket thickness	Replace with a gasket of the proper thickness.
Cylinder compression is lower than service limit.	Gas leakage around cylinder head	Replace damaged gasket and check cylinder head warp.
	Bad condition of valve seating	Repair if possible.
	Incorrect valve, piston/cylinder clearance	Adjust
	Piston seizure	Inspect the cylinder and liner and replace/repair as necessary.
	Bad condition of piston ring and/or piston ring grooves.	Replace

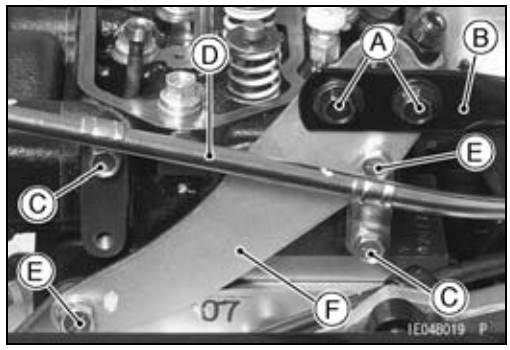
Cylinder Head Removal

- Remove:

Water Pump (see Water Pump Removal)
Fuel Injection Pipes (see Fuel Injection Pipe Removal in the Fuel System chapter)
Exhaust Pipe (see Exhaust Pipe Removal)
Rocker Arm Components (see Rocker Arm Components Removal)

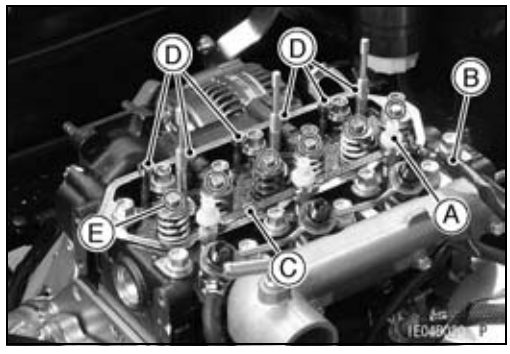
Cylinder Head

- Remove:
  Bolts [A] and Nuts
  Engine Mount Stay [B]
  Bolts [C]
  Oil Level Gauge Pipe [D]
  Bolts [E]
  Plate [F]



- Remove:
  Glow Plug Caps [A]
  Glow Plug Lead [B]
  Glow Plug Connecting Plate [C]
  Rocker Arm Push Rods [D]
  Valve Stem Caps [E]

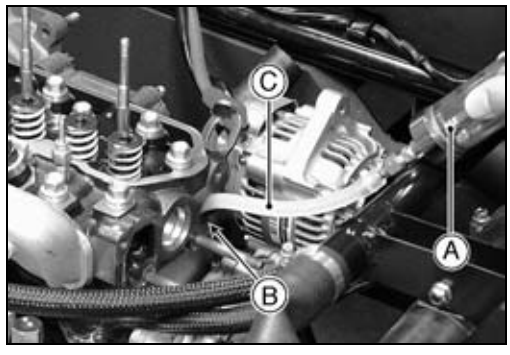
○Mark the push rods so that they may be installed in their original positions.



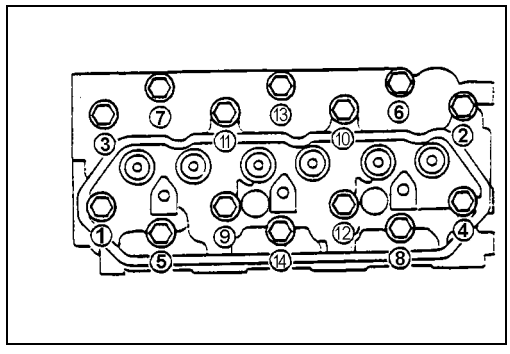
- Remove the coolant from the cylinder head, using a syringe [A] or some other suitable device, through the coolant inlet opening [B].

○Insert the gauge tube [C] 10 ~ 11 cm (3.9 ~ 4.3 in.) from the opening.

○Pull the handle slowly to pump out the coolant until the coolant no longer comes out.

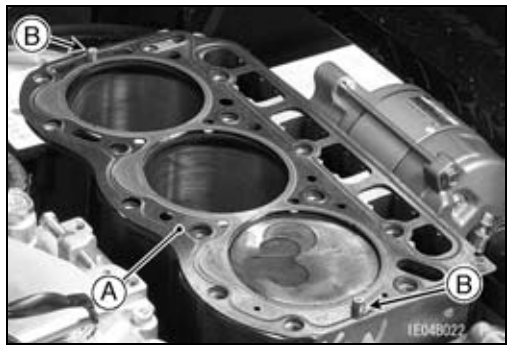


- Remove the cylinder head bolts following loosening sequence [1 ~ 14].
- Remove:
  Cylinder Head
  Cylinder Head Gasket



Cylinder Head Installation

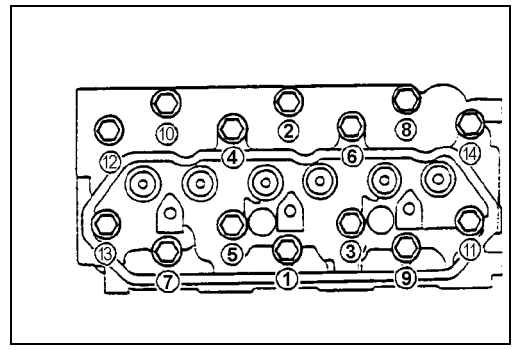
- Clean the mating surface of the cylinder head and the cylinder.
- Replace the cylinder head gasket [A] with a new one.
- Install the dowel pins [B].



Cylinder Head

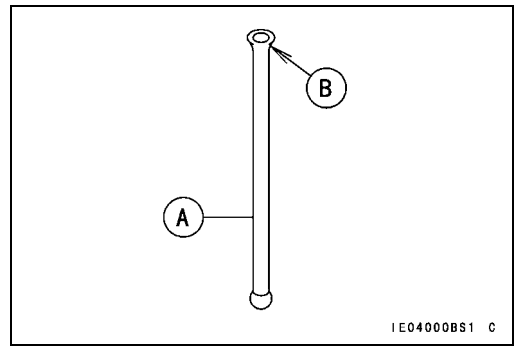
- Apply engine oil to the cylinder head bolts.
- Tighten the cylinder head bolts in the order shown.

Torque - Cylinder Head Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)



- Apply engine oil and install the rocker arm push rods [A] (in original locations if reused).

○Face the recessed end [B] upward.

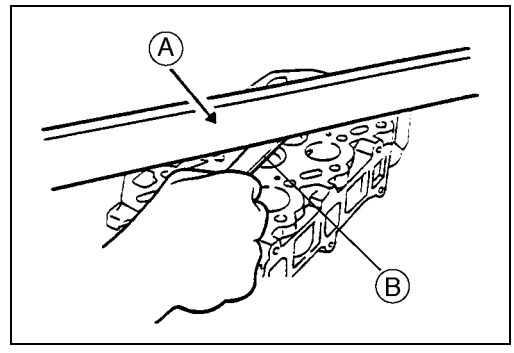


- Install:
  Valve Stem Caps
  Rocker Arm Components (see Rocker Arm Components Installation)
- Inspect the valve clearance (see Valve Clearance Inspection in the Periodic Maintenance chapter).
- Install the removed parts (see appropriate chapters).

Cylinder Head Warp

- Clean the cylinder head.
- Lay a straightedge [A] across the lower surface, inlet and exhaust manifold mounting surface of the head at several different points, and measure warp by inserting a thickness gauge [B] between the straightedge and the head.

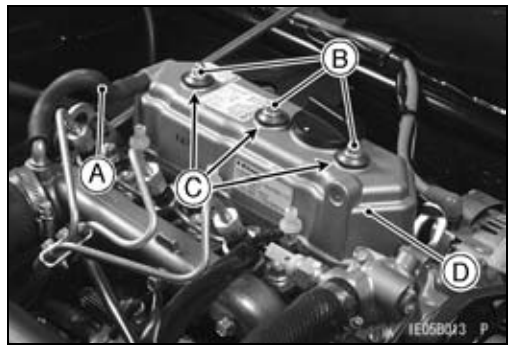
★If warp exceeds the service limit, repair the mating surface. Replace the cylinder head if the mating surface is badly damaged.



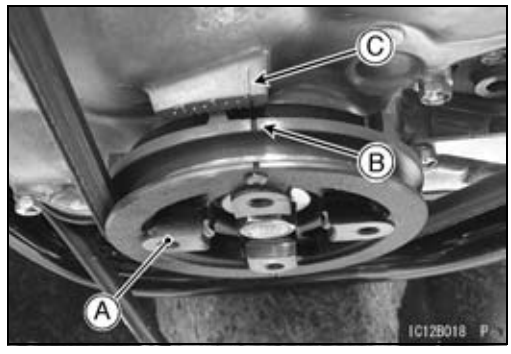
Cylinder Head Warp
Service Limit: 0.1 mm (0.004 in.)

Rocker Shaft and Rocker Arm

Rocker Arm Components Removal



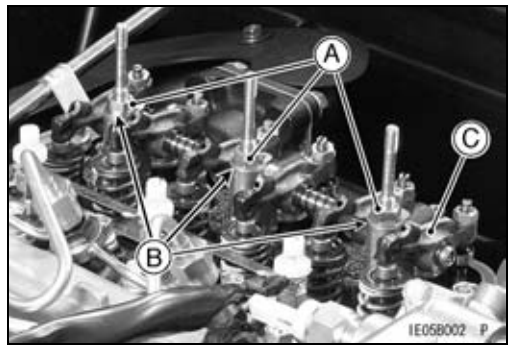
- Remove:
  Fan Belt Cover (see Cooling Fan Belt Inspection in the Periodic Maintenance chapter)
  Breather Hose [A]
  Cylinder Head Cover Bolts [B] and Washers [C]
  Cylinder Head Cover [D]



- Turn the crankshaft pulley [A] clockwise so that the timing mark [B] on the pulley aligns with the reference point [C] on the timing cover.

○Check that the rocker arms at #1 cylinder are free.

★If not, turn the pulley one more turn to free the rocker arms.



- Remove:
  Rocker Arm Components Mounting Nuts [A] and Washers [B]
  Rocker Arm Components [C]

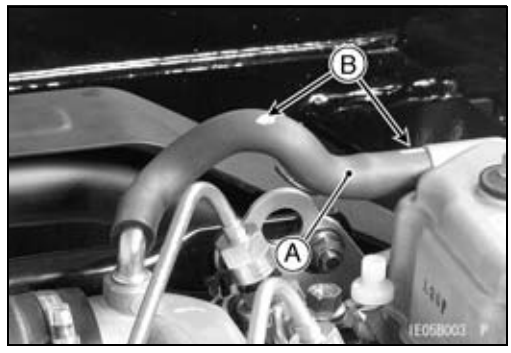
Rocker Arm Components Installation

- Install the rocker arm components.

Torque - Rocker Arm Components Mounting Nuts: 20 N·m (2.0 kgf·m, 15 ft·lb)

- Inspect the valve clearance (see Valve Clearance Inspection in the Periodic Maintenance chapter).
- Tighten:

Torque - Cylinder Head Cover Nuts: 5.4 N·m (0.55 kgf·m, 48 in·lb)



- Install the breather hose [A].

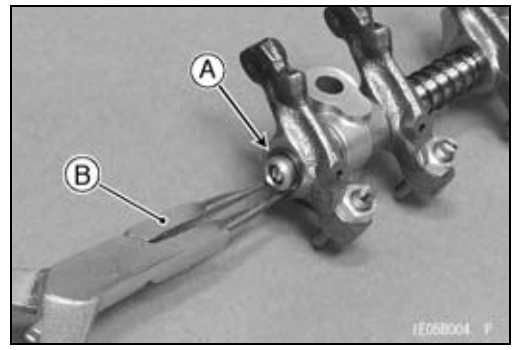
○Twist the breather hose so that the white marks [B] face upward and the center part is higher than both ends.

Rocker Shaft and Rocker Arm

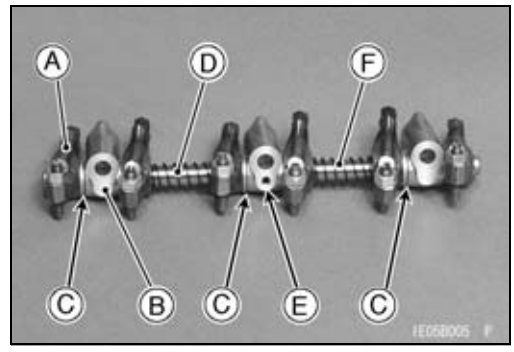
Rocker Arm Components Disassembly

● Remove:
Rocker Arm Components (see Rocker Arm Components Removal)
Circlips [A]

Special Tool - Outside Circlip Pliers [B]: 57001-144

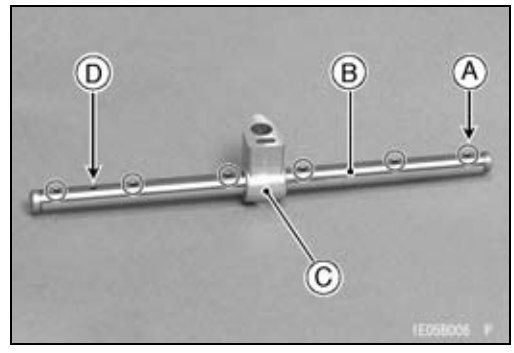


● Remove:
Rocker Arms [A]
Rocker Arm Supports [B]
Washers [C]
Springs [D]
Set Bolt [E]
Rocker Shaft [F]



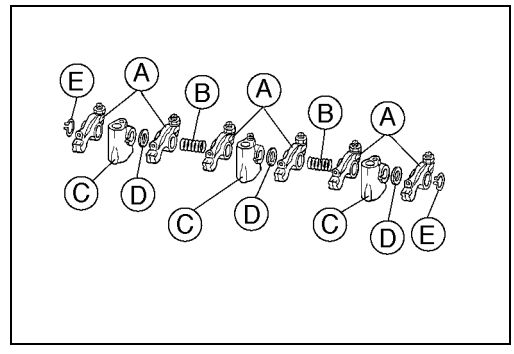
Rocker Arm Components Assembly

● Apply engine oil to the all components.
● Small grooves next to oil holes [A] in the rocker shaft [B] must face down.
● Install the center rocker arm support [C] as shown in the figure, and tighten the set bolt.
Left Lower Oil Hole [D]



● Install:
Rocker Arms [A]
Springs [B]
Rocker Arm Supports [C]
Washers [D]
New Circlips [E]

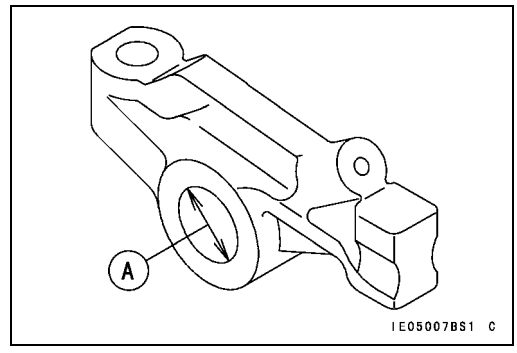
Special Tool - Outside Circlip Pliers: 57001-144



Rocker Arm/Shaft Wear

● Measure the inside diameter [A] of the rocker arm.
★ If the bearing has worn past the service limit, replace the rocker arm.

Rocker Arm Inside Diameter
Standard: 10.00 ~ 10.02 mm (0.3937 ~ 0.3945 in.)
Service Limit: 10.03 mm (0.3949 in.)

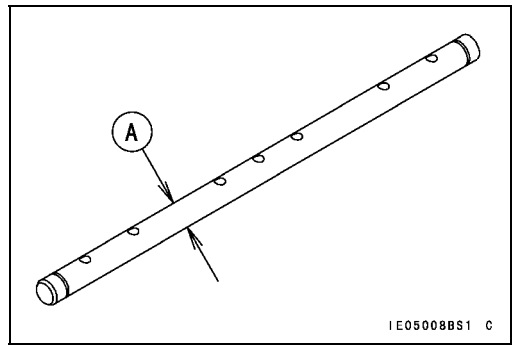


Rocker Shaft and Rocker Arm

● Measure the diameter [A] of the rocker shaft.
★ If the shaft has worn past the service limit, replace the rocker shaft.

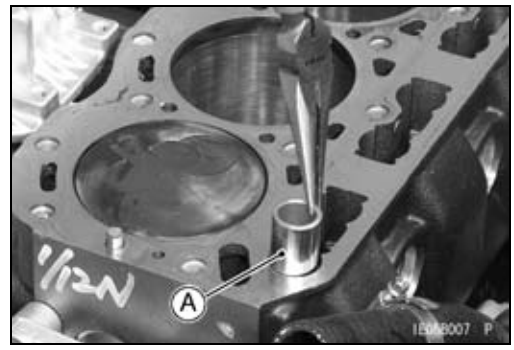
Rocker Shaft Diameter

Standard:	**9.97 ~ 9.99 mm (0.3925 ~ 0.3933 in.)**
Service Limit:	**9.957 mm (0.3920 in.)**



Valve Lifters

Valve Lifter Removal



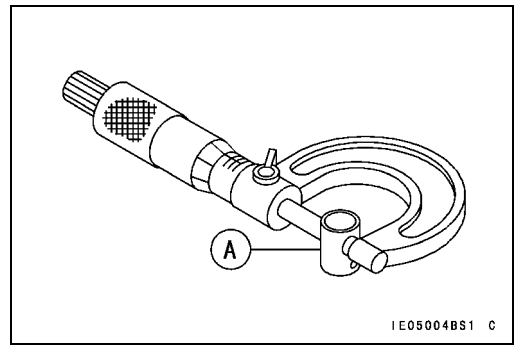
- Remove:
  Cylinder Head (see Cylinder Head Removal)
  Valve Lifters [A]

○Mark and record the valve lifter locations so that they can be installed in their original positions.

Valve Lifter Installation

- Apply engine oil and install the valve lifters (original positions).

Valve Lifter Inspection



- Measure the outside diameter of the valve lifters [A].

★If the valve lifter has worn past the service limit, replace the lifter.

Valve Lifter Outside Diameter

Standard:	**17.98 mm (0.7079 in.)**
Service Limit:	**17.91 mm (0.7051 in.)**

Valves

Valve Clearance Inspection

- Refer to the Valve Clearance Inspection in the Periodic Maintenance chapter.

Valve Clearance Adjustment

- Refer to the Valve Clearance Adjustment in the Periodic Maintenance chapter.

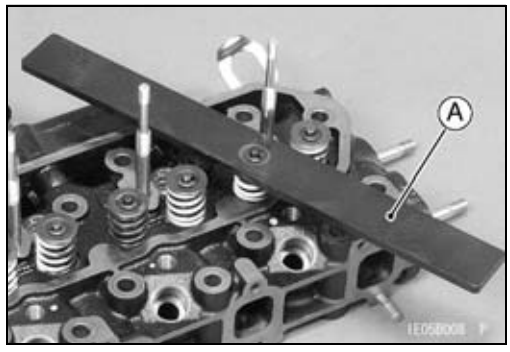
Valve Removal

- Remove:
  Cylinder Head (see Cylinder Head Removal)
  Valve Stem Cap

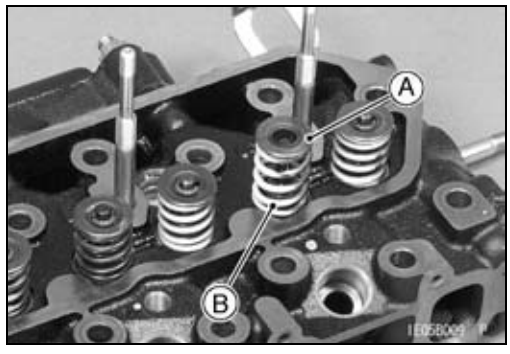
○Mark and record the valve stem cap locations so they can be installed in their original positions.

- Using the valve spring compressor [A] remove the split keepers.

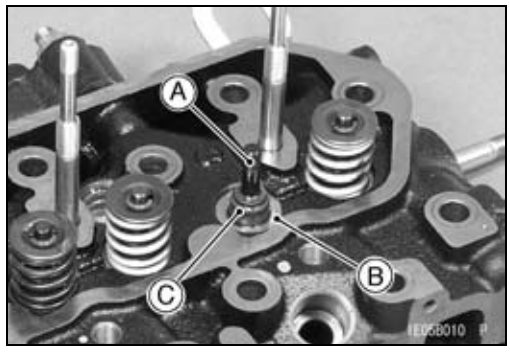
Special Tool - Valve Spring Compressor: 57001-1433



- Remove:
  Retainer [A]
  Valve Spring [B]

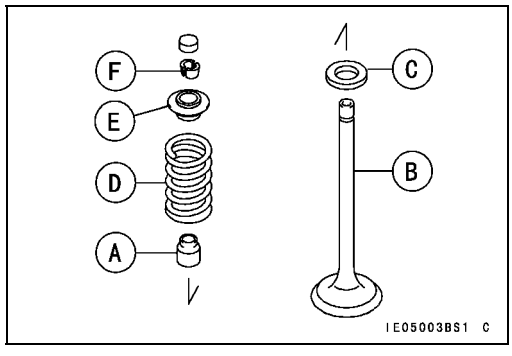


- Remove:
  Valve [A]
  Spring Seat [B]
  Oil Seal [C]



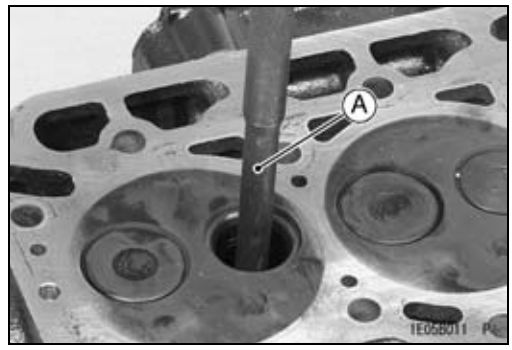
Valve Installation

- Replace the oil seal [A] with a new one.
- Apply a thin coat of molybdenum disulfide grease to the valve stem before valve installation.
- Install:
  Oil Seal
  Valve [B]
  Spring Seat [C]
  Valve Spring [D]
  Retainer [E]
  Split Keepers [F]



Valves

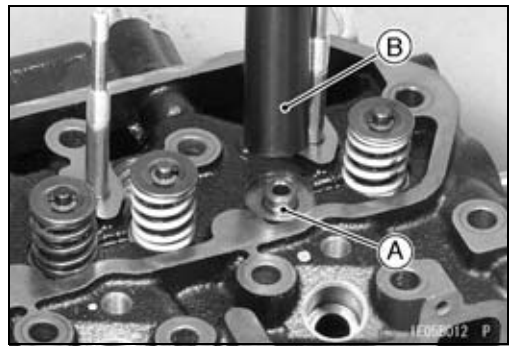
Valve Guide Removal



- Remove:
  Valve (see Valve Removal)
  Spring Seat
  Oil Seal
- Hammer lightly on the valve guide arbor [A] to remove the guide from the top of the head.

Special Tool - Valve Guide Arbor, ϕ5.5: 57001-1021

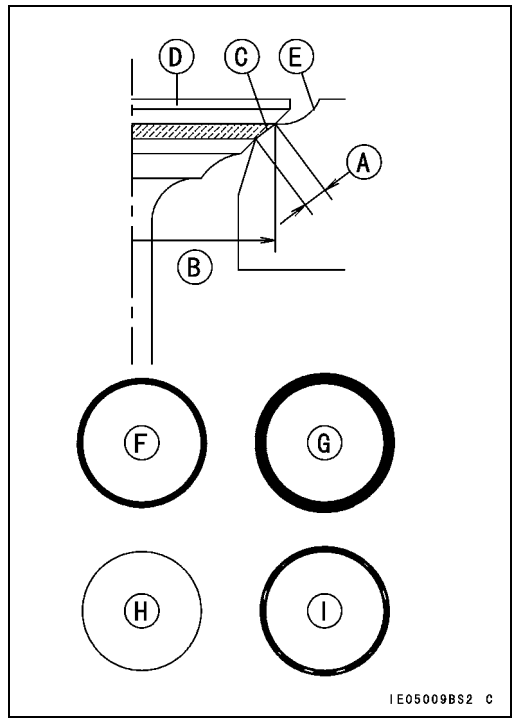
Valve Guide Installation



- Apply engine oil to the valve guide outer surface before installation.
- Press the valve guide [A] in from the top of the head using the valve guide driver [B] until the driver bottoms on cylinder head.

Special Tool - Valve Guide Driver: 57001-1432

Valve Seat Inspection



- Remove the valve (see Valve Removal).
- Coat the valve seat with machinist's dye.
- Push the valve into the guide.
- Rotate the valve against the seat with a lapping tool.
- Pull the valve out, and check the seating pattern on the valve head. It must be the correct width [A] and even all the way around.

NOTE

○*The valve stem and guide must be in good condition, or this check will not be valid.*

★If the valve seating pattern is not correct, repair the seat.

- Measure the outside diameter [B] of the seating pattern on the valve seat.

★If the outside diameter of the valve seating pattern is too large or too small, repair the seat.

Valve Seating Surface [C]	Too Wide [G]
Valve [D]	Too Narrow [H]
Valve Seat [E]	Uneven [I]
Good [F]	

Valve Seating Surface Width

Standard: 0.8 ~ 1.2 mm (0.0315 ~ 0.0472 in.)

Valve Seating Surface Outside Diameter

Inlet: 28 mm (1.1024 in.)

Exhaust: 24.5 mm (0.9646 in.)

Valves

Valve Seat Repair

● Follow the manufacturer's instructions for use of valve seat cutters.

Special Tools - Valve Seat Cutter Holder, ϕ5.5: 57001-1125
Valve Seat Cutter Holder Bar: 57001-1128

[For Inlet Valve Seat]

Valve Seat Cutter, 45° - ϕ27.5: 57001-1114

Valve Seat Cutter, 60° - ϕ30: 57001-1123

[For Exhaust Valve Seat]

Valve Seat Cutter, 32° - ϕ28: 57001-1119

Valve Seat Cutter, 30° - ϕ30: 57001-1120

★If the manufacturer's instructions are not available, use the following procedure.

Seat Cutter Operation Care

1. This valve seat cutter is developed to grind the valve for repair. Therefore the cutter must not be used for other purposes than seat repair.
2. Do not drop or shock the valve seat cutter, or the diamond particles may fall off.
3. Do not fail to apply engine oil to the valve seat cutter before grinding the seat surface. Also wash off ground particles sticking to the cutter with washing oil.

NOTE

○*Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.*

4. Setting the valve seat cutter holder in position, operate the cutter in one hand. Do not apply too much force to the diamond portion.

NOTE

○*Prior to grinding, apply engine oil to the cutter and during the operation, wash off any ground particles sticking to the cutter with washing oil.*

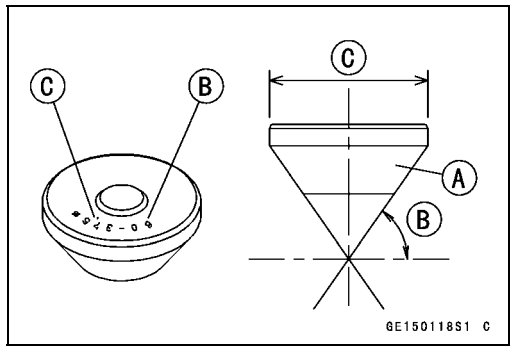
5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

Marks Stamped on the Cutter

The marks stamped on the back of the cutter [A] represent the following.

60° ..... Cutter angle [B]

37.5ϕ ..... Outer diameter of cutter [C]



Valves

Operating Procedures

- Clean the seat area carefully.
- Coat the seat with machinist's dye.
- Fit a 45° cutter into the holder and slide it into the valve guide.
- Press down lightly on the handle and turn it right or left. Grind the seating surface only until it is smooth.

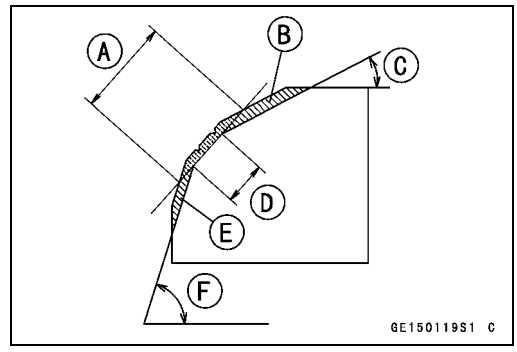
CAUTION

Do not grind the seat too much. Overgrinding will reduce valve clearance by sinking the valve into the head. If the valve sinks too far into the head, it will be impossible to adjust the clearance, and the cylinder head must be replaced.

- Measure the outside diameter of the seating surface with a vernier caliper.

★If the outside diameter of the seating surface is too small, repeat the 45° grind until the diameter is within the specified range.

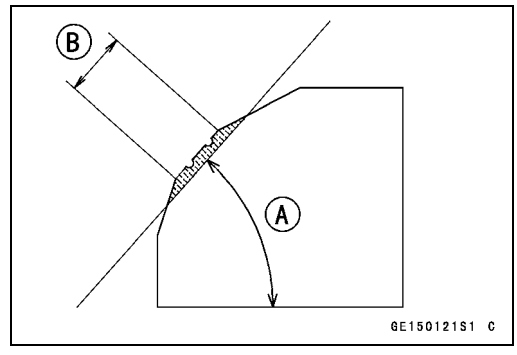
Widened Width [A] of engagement by machining with 45° cutter
Ground Volume [B] by 32° cutter
32° [C]
Correct Width [D]
Ground Volume [E] by 60° cutter
60° [F]



- Measure the outside diameter of the seating surface with a vernier caliper.

★If the outside diameter of the seating surface is too small, repeat the 45° grind [A] until the diameter is within the specified range.

Original Seating Surface [B]

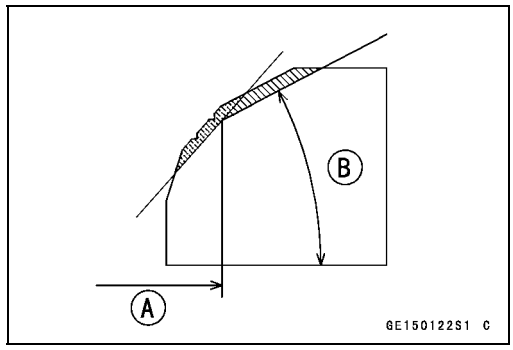


NOTE

○*Remove all pittings of flaws from 45° ground surface.*
○*After grinding with 45° cutter, apply thin coat of machinist's dye to seating surface. This makes seating surface distinct and 32° and 60° grinding operation easier.*
○*When the valve guide is replaced, be sure to grind with 45° cutter for centering and good contact.*

Valves

★If the outside diameter [A] of the seating surface is too large, make the 32° grind described below.
★If the outside diameter of the seating surface is within the specified range, measure the seat width as described below.
● Grind the seat at a 32° angle [B] until the seat outside diameter is within the specified range.
○To make the 32° grind, fit a 32° cutter into the holder, and slide it into the valve guide.
○Turn the holder one turn at a time while pressing down very lightly. Check the seat after each turn.

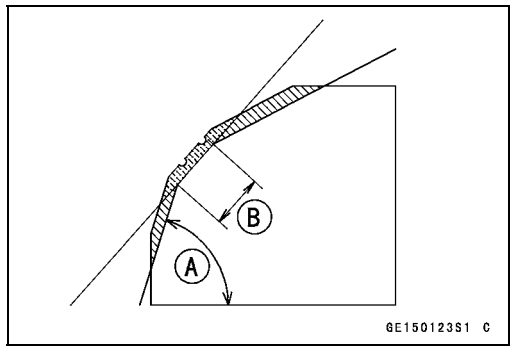


CAUTION

The 32° cutter removes material very quickly. Check the seat outside diameter frequently to prevent overgrinding.

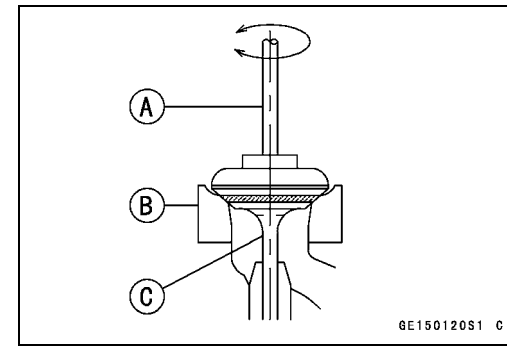
○After making the 32° grind, return to the seat outside diameter measurement step above.
● To measure the seat width, use a vernier caliper to measure the width of the 45° angle portion of the seat at several places around the seat.
★If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat outside diameter measurement step above.

★If the seat width is too wide, make the 60° [A] grind described below.
★If the seat width is within the specified range, lap the valve to the seat as described below.
● Grind the seat at a 60° angle until the seat width is within the specified range.
○To make the 60° grind, fit 60° cutter into the holder, and slide it into the valve guide.
○Turn the holder, while pressing down lightly.
○After making the 60° grind, return to the seat width measurement step above.



Correct Width [B]

Valves



- Lap the valve to the seat, once the seat width and outside diameter are within the ranges specified above.

○Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.

○Spin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.

○Repeat the process with a fine grinding compound.

Lapper [A]
Valve Seat [B]
Valve [C]

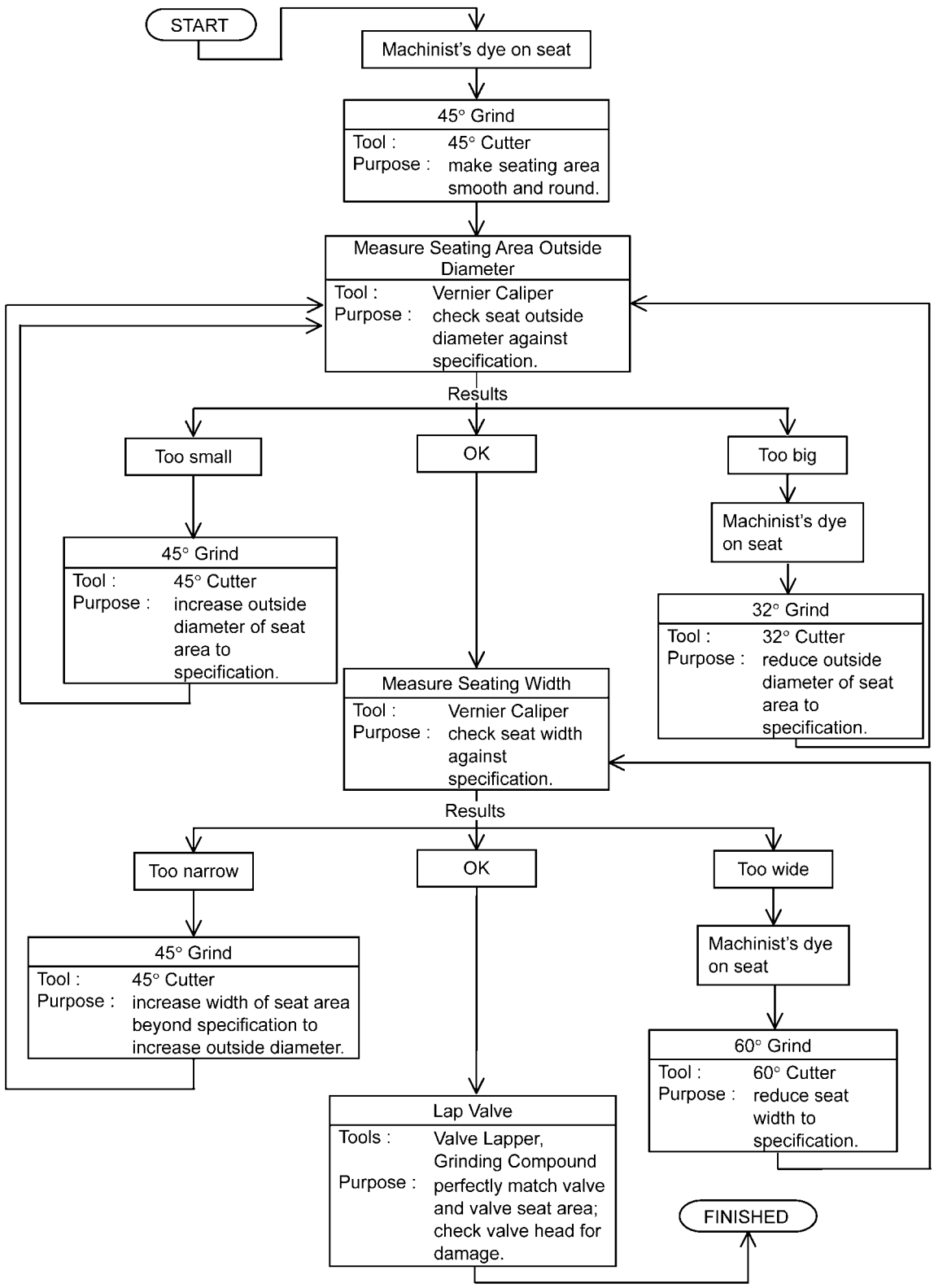
- The seating area should be marked about in the middle of the valve face.

★If the seat area is not in the right place on the valve, check to be sure the valve is the correct part. If it is, it may have been refaced too much; replace it.

- Be sure to remove all grinding compound before assembly.
- When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Inspection in the Periodic Maintenance chapter).

Valves

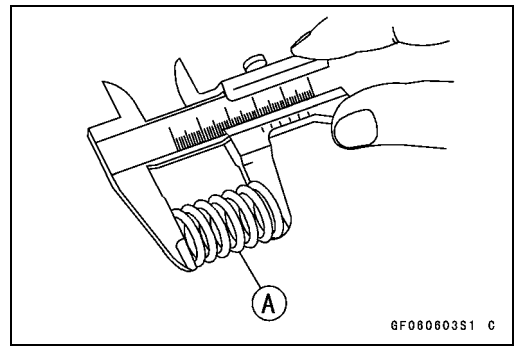
Valve Seat Repair


START
Machinist's dye on seat
45° Grind
Tool : 45° Cutter
Purpose : make seating area smooth and round.
Measure Seating Area Outside Diameter
Tool : Vernier Caliper
Purpose : check seat outside diameter against specification.
Results
Too small
OK
Too big
45° Grind
Tool : 45° Cutter
Purpose : increase outside diameter of seat area to specification.
Machinist's dye on seat
32° Grind
Tool : 32° Cutter
Purpose : reduce outside diameter of seat area to specification.
Measure Seating Width
Tool : Vernier Caliper
Purpose : check seat width against specification.
Results
Too narrow
OK
Too wide
45° Grind
Tool : 45° Cutter
Purpose : increase width of seat area beyond specification to increase outside diameter.
Machinist's dye on seat
60° Grind
Tool : 60° Cutter
Purpose : reduce seat width to specification.
Lap Valve
Tools : Valve Lapper, Grinding Compound
Purpose : perfectly match valve and valve seat area; check valve head for damage.
FINISHED

GE15143B F

Valves

Valve Spring Free Length



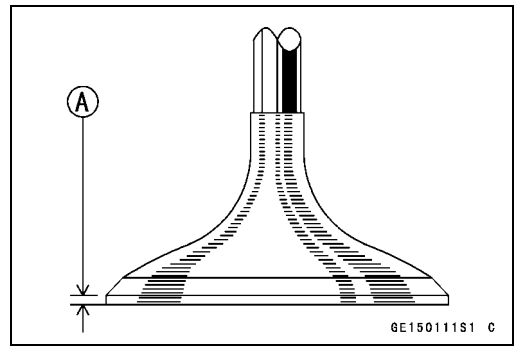
- Measure the valve spring free length.

★If the free length is less than the service limit, replace the valve spring [A] with a new one.

Valve Spring Free Length

Standard:	**30.7 mm (1.2087 in.)**
Service Limit:	**29.7 mm (1.1693 in.)**

Valve Head Thickness



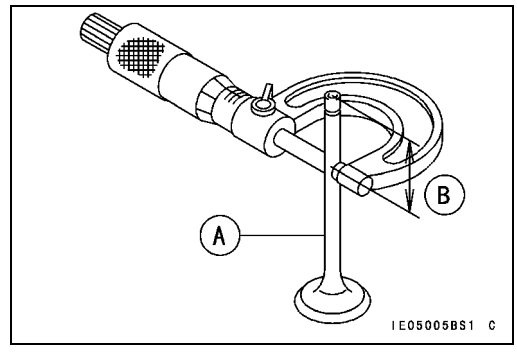
- Measure the thickness [A] of the valve head.

★If the valve head thickness is less than the service limit, replace the valve with a new one.

Valve Head Thickness

Standard:	**1.2 mm (0.0472 in.)**
Service Limit:	**1.0 mm (0.0394 in.)**

Valve Stem Diameter



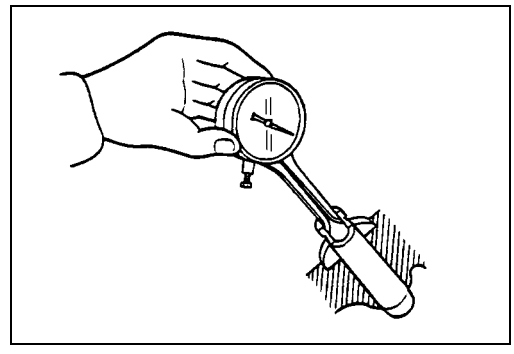
- Measure the diameter of the valve stem at specified distance from end of the valve [A] as shown in the figure.
  35 mm (1.38 in.) [B]

★If any single measurement is less than the service limit, replace the valve with a new one.

Valve Stem Diameter

Standard:	
Inlet	**5.945 ~ 5.960 mm (0.2341 ~ 0.2346 in.)**
Exhaust	**5.965 ~ 5.980 mm (0.2348 ~ 0.2354 in.)**
Service Limit:	
Inlet	**5.903 mm (0.2324 in.)**
Exhaust	**5.923 mm (0.2332 in.)**

Valve Guide Inspection



- Measure the inside diameter of the valve guide.

★If the valve guide has worn past the service limit, replace the valve guide or cylinder head.

Valve Guide Inside Diameter

Standard:	**6.000 ~ 6.015 mm (0.2362 ~ 0.2368 in.)**
Service Limit:	**6.036 mm (0.2376 in.)**

○Measure the outside diameter of the valve guide removed.

★If the diameter is 11.05 mm (0.4350 in.), replace it with a replacement valve guide.

★If the diameter is 11.08 mm (0.4362 in.), it is a replacement valve guide. Replace the cylinder head.

Valve Guide Outside Diameter

Standard Valve Guide:	**11.05 mm (0.4350 in.)**
Replacement Valve Guide:	**11.08 mm (0.4362 in.)**

Valves

Measuring Valve/Guide Clearance

● Subtract the valve stem diameter from the valve guide inside diameter to get the valve/valve guide clearance.

Valve/Guide Clearance

Standard:

Inlet	**0.055 ~ 0.070 mm (0.0022 ~ 0.0028 in.)**
Exhaust	**0.035 ~ 0.050 mm (0.0014 ~ 0.0020 in.)**

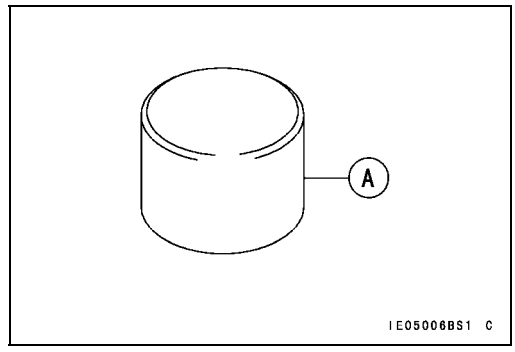
Service Limit:

Inlet	**0.090 mm (0.0035 in.)**
Exhaust	**0.094 mm (0.0037 in.)**

Valve Stem Cap Inspection

● Visually inspect the valve stem cap [A] for wear.

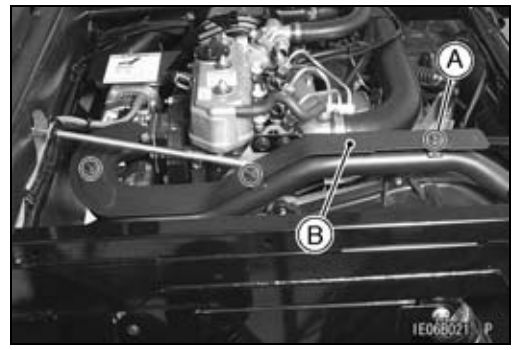
★If the cap is worn, replace it.



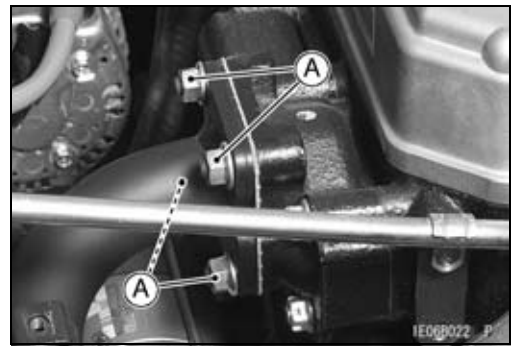
Exhaust Pipe and Muffler

Exhaust Pipe Removal

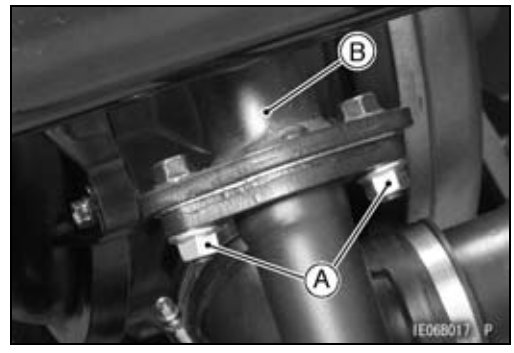
- Tilt up the cargo bed.
- Remove:
  Bolts [A] and Washers
  Exhaust Pipe Cover [B]



- Remove the exhaust pipe holder nuts [A].



- Remove:
  Joint Bolts and Nuts [A]
  Exhaust Pipe [B]

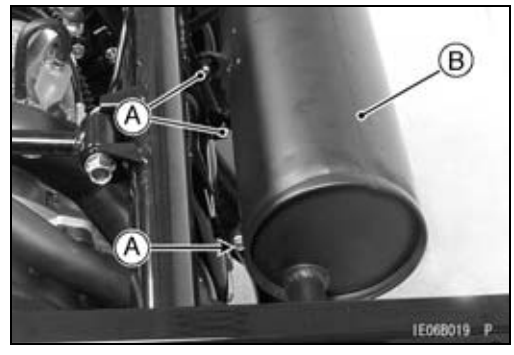


Muffler Removal

- Remove the joint bolts and nuts [A].



- Remove:
  Muffler Mounting Bolts [A]
  Muffler [B]



Exhaust Pipe and Muffler

Exhaust Pipe and Muffler Installation

- Apply a non-permanent locking agent to the threads of the muffler mounting bolts.
- Replace the exhaust pipe gasket and muffler connecting gasket with new ones.
- After installation, thoroughly warm up the engine, wait until the engine cools down, retighten all the bolts and nuts.

Exhaust Pipe and Muffler Inspection

- Before removing, check for signs of leakage at the exhaust pipe gasket in the cylinder head and at the muffler joint.

★If there are signs of leakage around the exhaust pipe gasket, it should be replaced. If the muffler-to-exhaust pipe joint leaks, tighten the joint bolts.

- Check the exhaust pipe and muffler for dents, cracks, rust and holes.

★If the exhaust pipe or muffler is damaged, it should be replaced for best performance and least noise.

Spark Arrester Cleaning

- Refer to the Spark Arrester Cleaning in the Periodic Maintenance chapter.

Converter System

Table of Contents

Exploded View 6-2
Specifications 6-6
Special Tools 6-7
Air Cleaner 6-8
- Air Cleaner Housing Removal 6-8
- Air Cleaner Housing Installation 6-8
- Air Cleaner Element Removal 6-8
- Air Cleaner Element Cleaning/Inspection 6-9

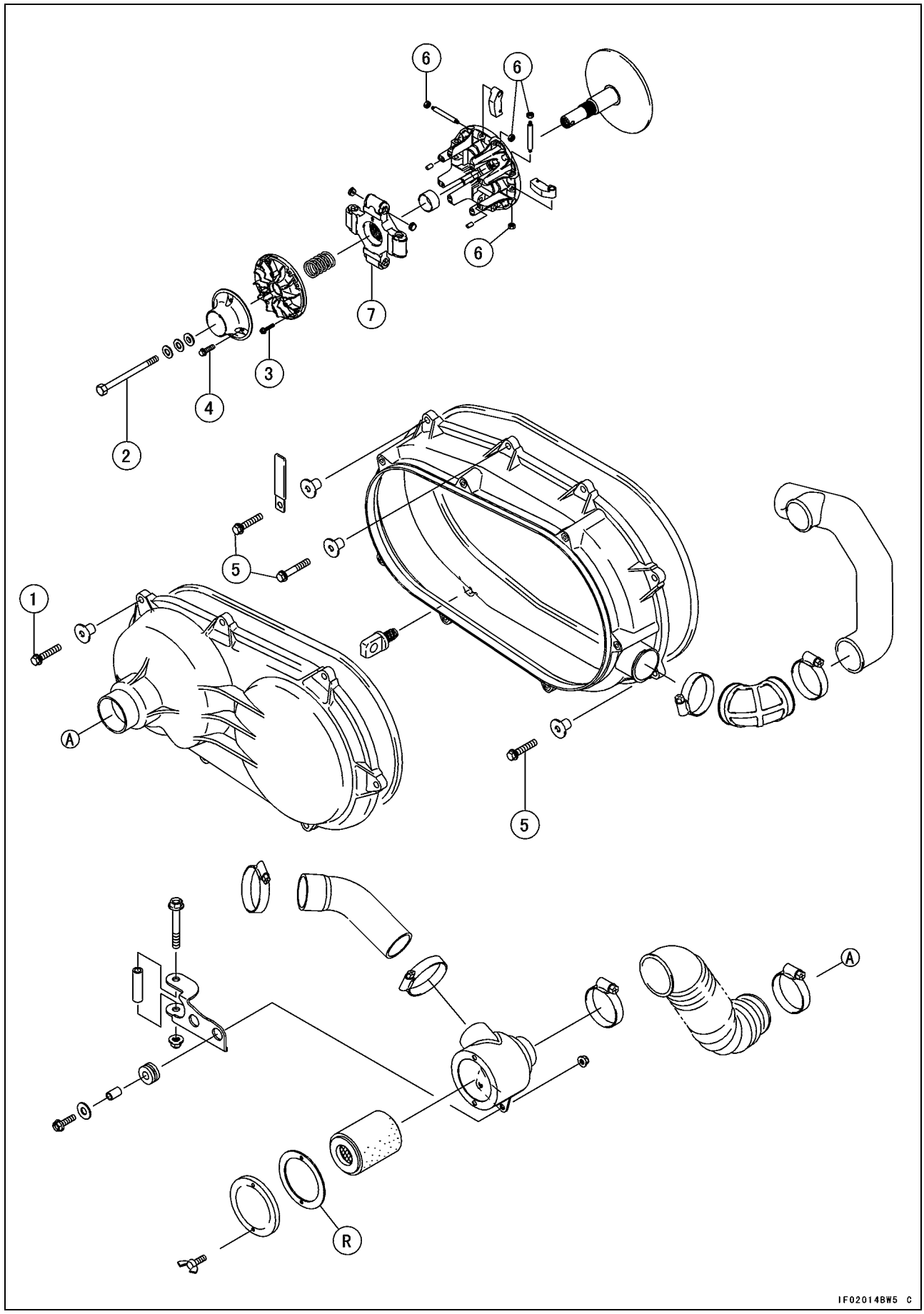
Torque Converter 6-10
- Torque Converter Outer Cover Removal 6-10
- Torque Converter Outer Cover Installation 6-10
- Torque Converter Inner Cover Removal 6-10
- Torque Converter Inner Cover Installation 6-11
- Torque Converter Case Removal 6-11
- Torque Converter Case Installation 6-12
- Torque Converter Case Disassembly 6-12
- Torque Converter Case Assembly 6-13

Drive Belt 6-14
- Drive Belt Removal 6-14
- Drive Belt Installation 6-14
- Drive Belt Inspection 6-14
- Drive Belt Deflection Inspection 6-14
- Drive Belt Deflection Adjustment 6-15

Drive Pulley 6-16
- Drive Pulley Removal 6-16
- Drive Pulley Disassembly 6-16
- Drive Pulley Inspection 6-17
- Spider Shoe Side Clearance Adjustment 6-19
- Drive Pulley Assembly 6-21
- Bushing Installation 6-22
- Drive Pulley Installation 6-22

Driven Pulley 6-23
- Driven Pulley Removal 6-23
- Driven Pulley Disassembly 6-23
- Driven Pulley Inspection 6-24
- Converter Driven Pulley Shoe Inspection 6-25
- Driven Pulley Assembly 6-25
- Driven Pulley Installation 6-26

Exploded View

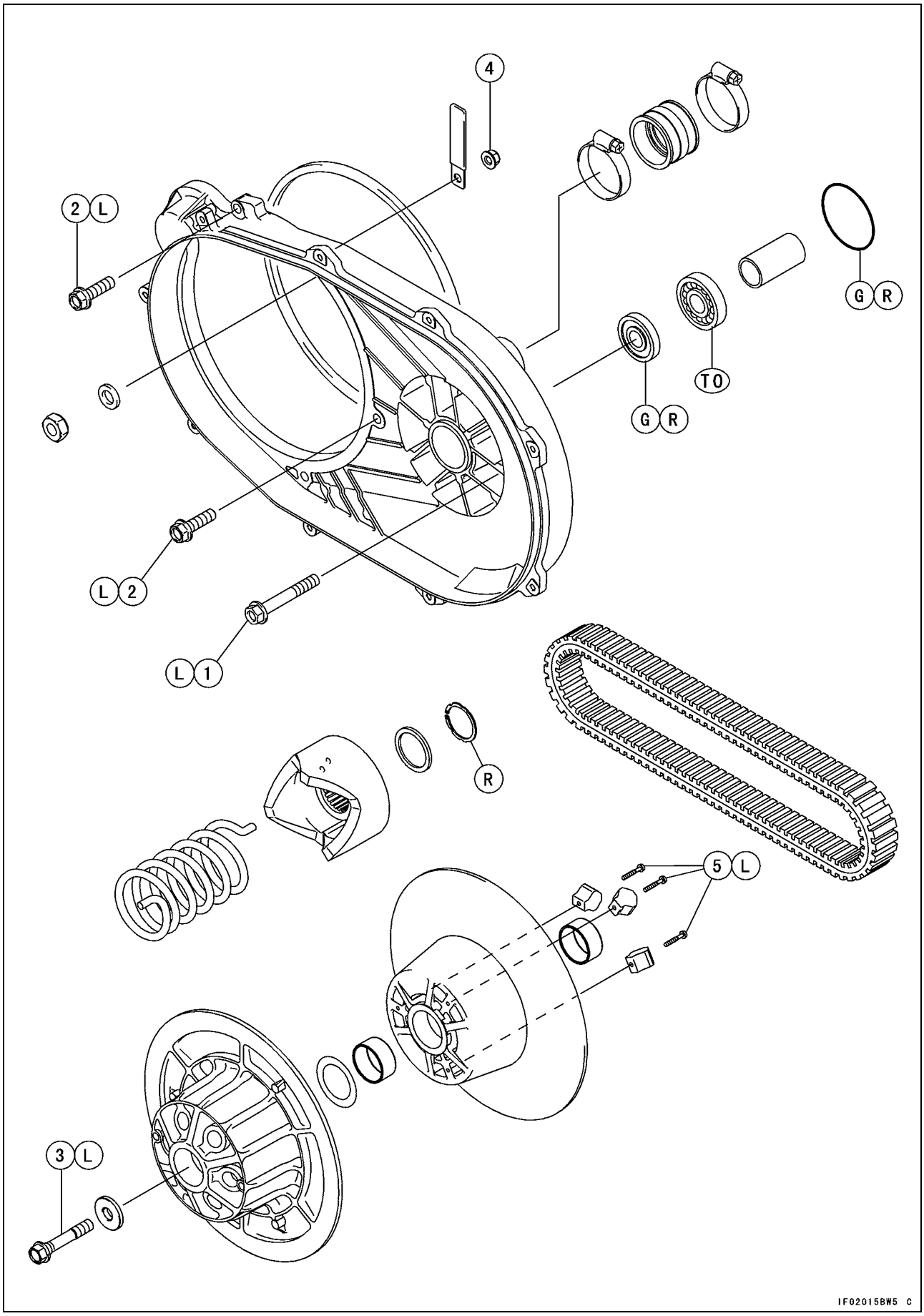


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Converter Cover Bolts	4.4	0.45	39 in·lb	
2	Drive Pulley Bolt	93	9.5	69	
3	Drive Pulley Cover Bolts	13	1.3	115 in·lb	
4	Fan Cover Bolts	8.8	0.90	78 in·lb	
5	Inner Cover Bolts	4.4	0.45	39 in·lb	
6	Ramp Weight Nuts	6.9	0.70	61 in·lb	
7	Spider	275	28.0	203	

R: Replacement Parts

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Converter Case Bolts (L = 55 mm)	27	2.8	20	L
2	Converter Case Bolts (L = 28 mm)	20	2.0	15	L
3	Driven Pulley Bolt	93	9.5	69	L
4	Inner Cover Nut	8.8	0.90	78 in·lb	
5	Wear Shoe Mounting Screws	1.1	0.11	10 in·lb	L

G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
TO: Apply transmission oil.

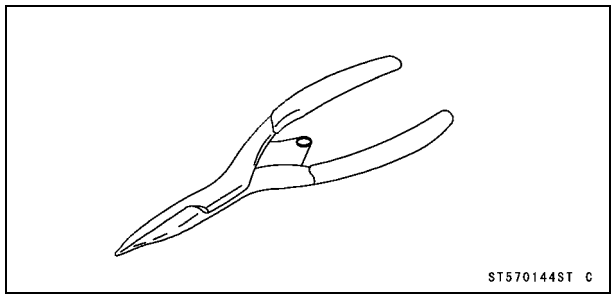
6-6 CONVERTER SYSTEM

Specifications

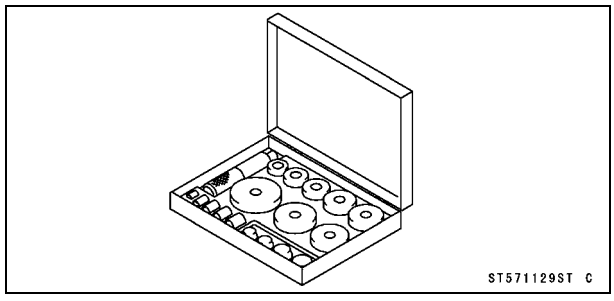
Item	Standard	Service Limit
Drive Belt		
Belt Width	34.1 mm (1.34 in.)	32.6 mm (1.28 in.)
Belt Deflection	28 ~ 36 mm (1.10 ~ 1.42 in.)	– – –
Drive Pulley		
Cover Bushing Inside Diameter	27.655 ~ 27.955 mm (1.089 ~ 1.101 in.)	27.99 mm (1.102 in.)
Sheave Bushing Inside Diameter	38.055 ~ 38.155 mm (1.498 ~ 1.502 in.)	38.19 mm (1.504 in.)
Spring Free Length	77 mm (3.03 in.)	75.6 mm (2.98 in.)
Shoe Side Clearance	0.05 ~ 0.20 mm (0.0020 ~ 0.0079 in.)	– – –
Driven Pulley		
Movable Sheave Bushing Inside Diameter	39.655 ~ 39.965 mm (1.561 ~ 1.573 in.)	40 mm (1.57 in.)
Wear Shoe Width	– – –	16.4 mm (0.65 in.)
Spring Free Length	137.5 mm (5.41 in.)	130.4 mm (5.13 in.)

Special Tools

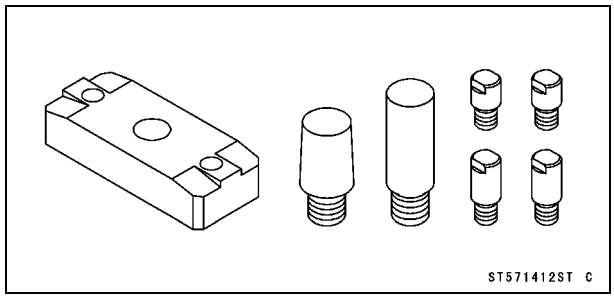
Outside Circlip Pliers:
57001-144



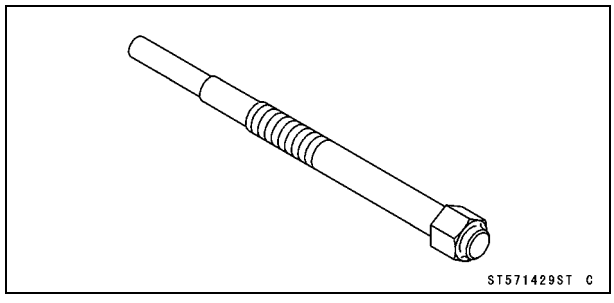
Bearing Driver Set:
57001-1129



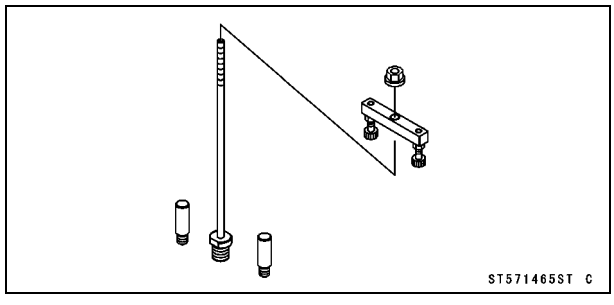
Drive & Driven Pulley Holder:
57001-1412



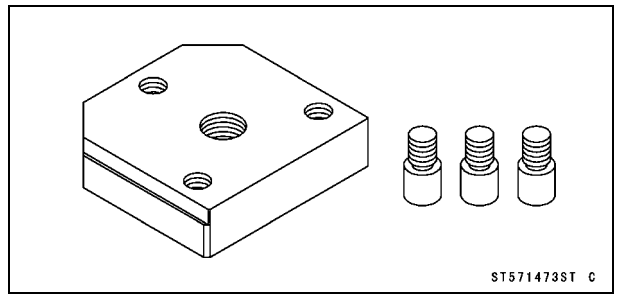
Drive Pulley Puller Bolt:
57001-1429



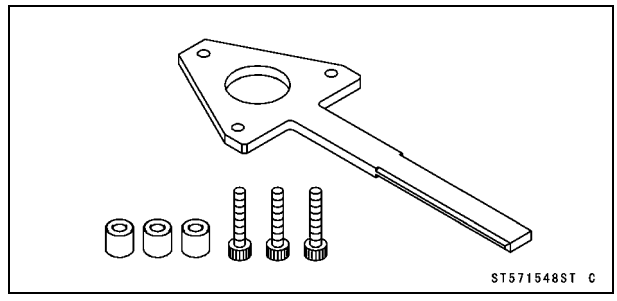
Driven Pulley Holder:
57001-1465



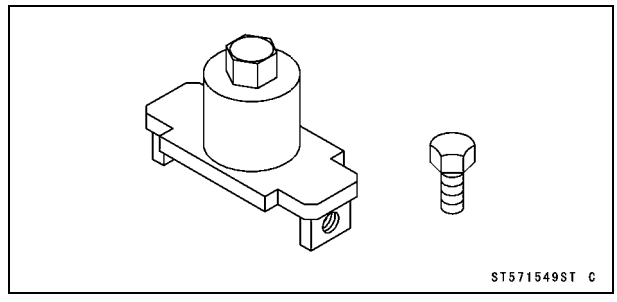
Drive & Driven Pulley Holder:
57001-1473



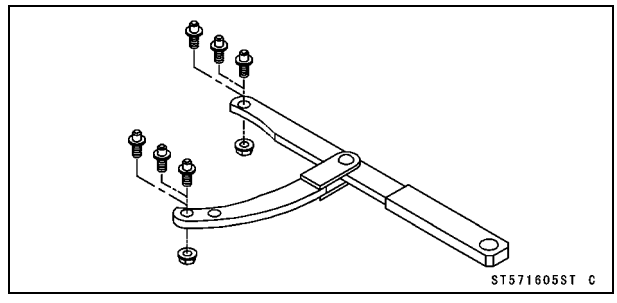
Drive Pulley Holder:
57001-1548



Drive Pulley Wrench:
57001-1549

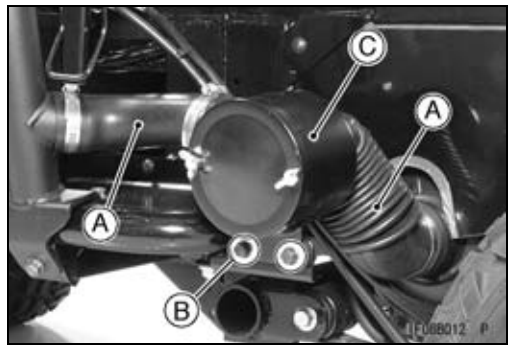


Flywheel & Pulley Holder:
57001-1605



Air Cleaner

Air Cleaner Housing Removal

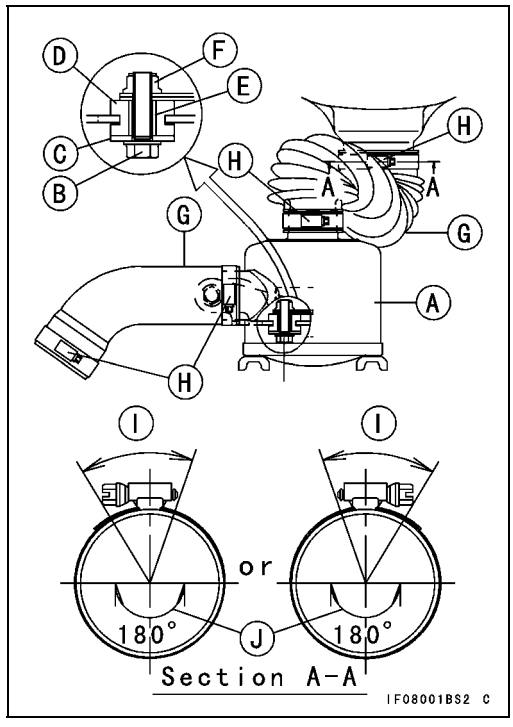


- Remove the air ducts [A].
- Remove:
  Bracket Bolts [B], Washers, Collars and Nuts
  Air Cleaner Housing [C]
- After removing the housing, stuff pieces of lint-free, clean cloth into the torque converter cover duct to keep dirt out of the torque converter.

CAUTION

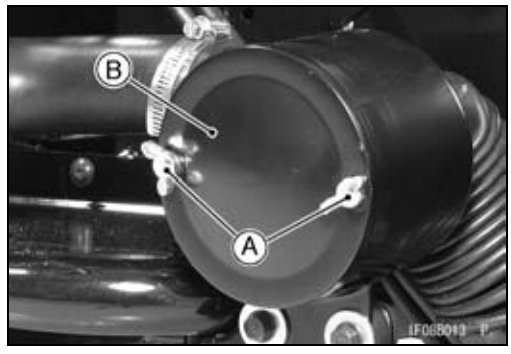
If dirt gets into the torque converter, excessive wear and loss of driving power may result.

Air Cleaner Housing Installation



- Install:
  Air Cleaner Housing [A]
  Bracket Bolt [B]
  Washer [C]
  Damper [D] (The shorter side faces outward.)
  Collar [E]
  Nut [F]
  Air Ducts [G]
  Clamps [H]
- Tighten the clamp so that the range [I] does not enter in the area [J].

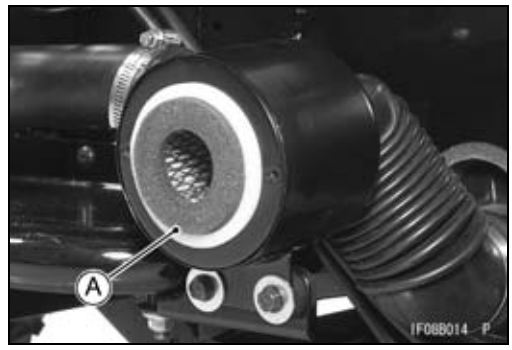
Air Cleaner Element Removal



- Remove:
  Wingbolts [A]
  Cap [B]

Air Cleaner

- Remove the air cleaner element [A].
- After removing the element, stuff pieces of lint-free, clean cloth into the air cleaner duct to keep dirt out of the torque converter.



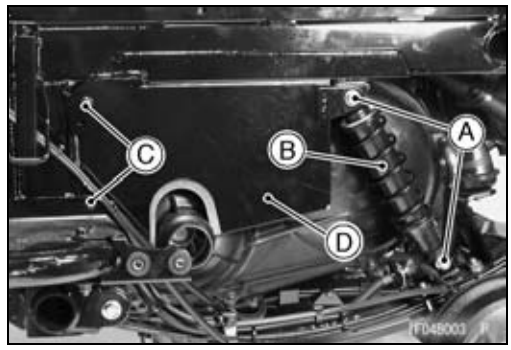
CAUTION
If dirt gets into the torque converter, excessive wear and loss of driving power may result.

Air Cleaner Element Cleaning/Inspection

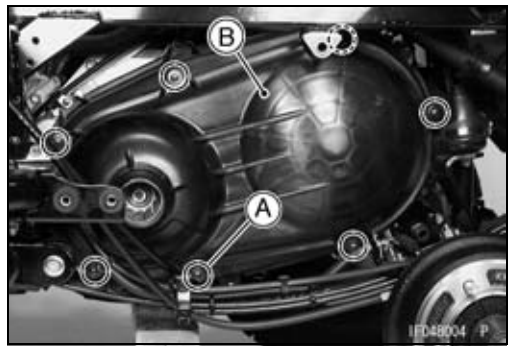
- Refer to the Converter Air Cleaner Element Cleaning/Inspection in the Periodic Maintenance chapter.

Torque Converter

Torque Converter Outer Cover Removal



- Lift up the cargo easy to work.
- Remove:
  Converter Air Cleaner Housing (see Air Cleaner Housing Removal)
  Left Rear Wheel (see Wheel Removal in the Wheels/Tires chapter)
  Left Rear Shock Absorber Mounting Bolts and Nuts [A] (while moving the frame up and down with jack)
  Left Rear Shock Absorber [B]
  Screws [C]
  Cover [D]



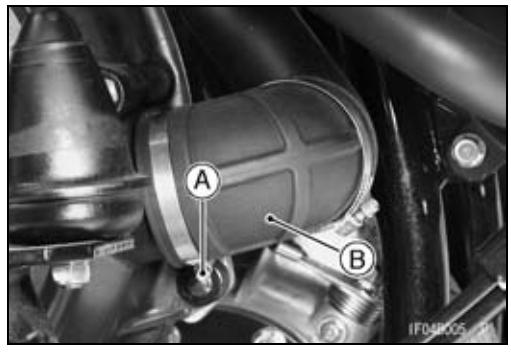
- Remove:
  Cuter Cover Bolts [A] and Collars
  Torque Converter Outer Cover [B]

Torque Converter Outer Cover Installation

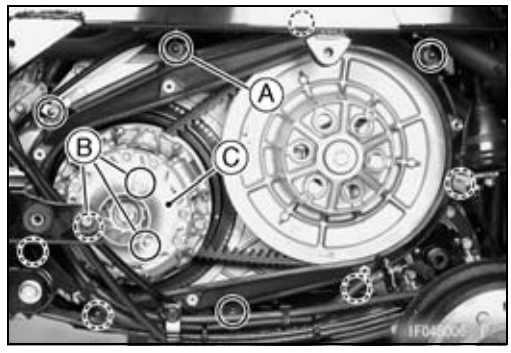
- Installation is basically the reverse of removal.
- Tighten:

Torque - Converter Cover Bolts: 4.4 N·m (0.45 kgf·m, 39 in·lb)

Torque Converter Inner Cover Removal



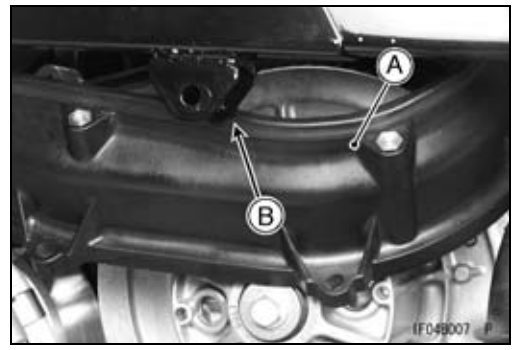
- Remove:
  Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
  Torque Converter Outer Cover (see Torque Converter Outer Cover Removal)
- Loosen the clamp [A] and separate the air duct [B] from the cover.



- Remove:
  Inner Cover Bolts [A] and Collars
  Fan Cover Bolts [B]
  Fan Cover [C]

Torque Converter

● Remove the inner cover [A] upward pushing the trim [B] of the cover as shown.



Torque Converter Inner Cover Installation

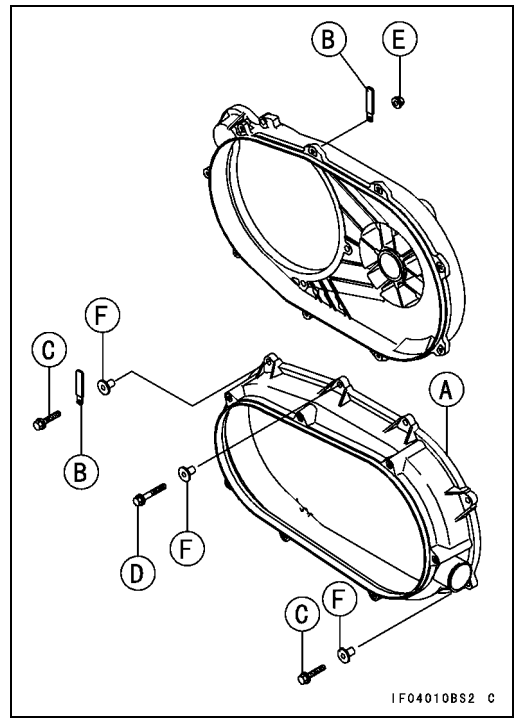
● Install:
Inner Cover [A]
Clamps [B]
Inner Cover Bolts (L = 30 mm (1.18 in.)) [C]
Inner Cover Bolt (L = 35 mm (1.38 in.)) [D]
Nut [E]
Collars [F]

★When installing the trim, add the glue to the place between bolt hole and bolt hole.

● Tighten:

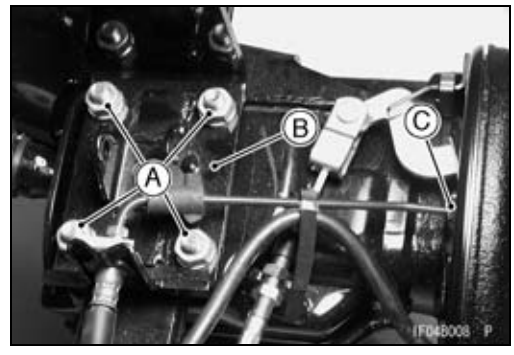
Torque - Inner Cover Bolts: 4.4 N·m (0.45 kgf·m, 39 in·lb)
Inner Cover Nut: 8.8 N·m (0.90 kgf·m, 78 in·lb)
Fan Cover Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

● Install the removed parts (see appropriate chapters).

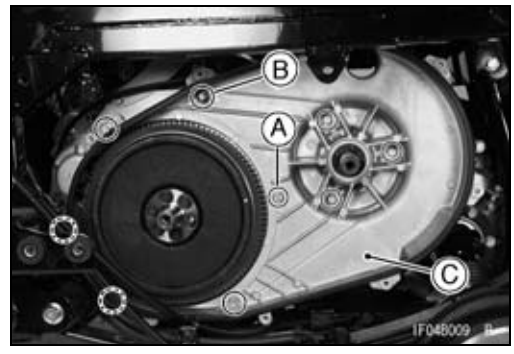


Torque Converter Case Removal

● Remove:
Drive Pulley (see Drive Pulley Removal)
Driven Pulley (see Driven Pulley Removal)
Damper Bracket Nuts [A] and Bracket [B]
Left Rear Brake Pipe End [C]

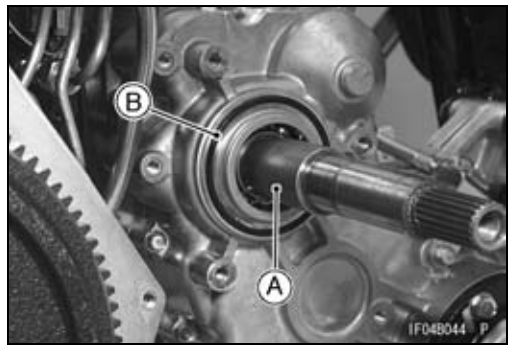


● Remove:
Converter Case Bolts [A]
Converter Case Nut [B] and Washer
Torque Converter Case [C]

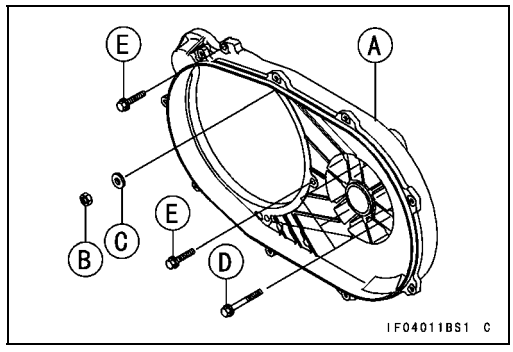


Torque Converter

Torque Converter Case Installation

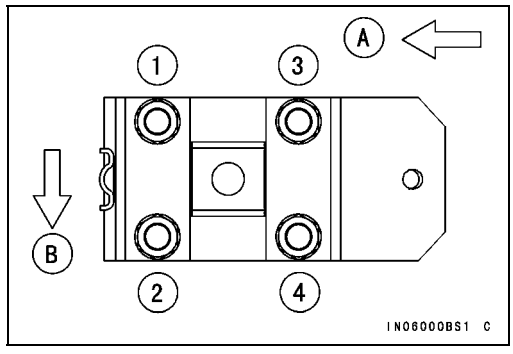


- Be sure to install the following on the drive shaft and transmission case.
  Collar [A]
  O-ring [B]
- Confirm the engine and transmission case position (see Engine Installation in the Engine Removal/Installation chapter).



- Install:
  Torque Converter Case [A]
  Nut [B] and Washer [C]
- Apply a non-permanent locking agent to the following bolts and install them.
  Converter Case Bolts (L = 55 mm (2.17 in.)) [D]
  Converter Case Bolts (L = 28 mm (1.10 in.)) [E]
- Tighten:

Torque - Converter Case Bolts (L = 55 mm): 27 N·m (2.8 kgf·m, 20 ft·lb)
Converter Case Bolts (L = 28 mm): 20 N·m (2.0 kgf·m, 15 ft·lb)



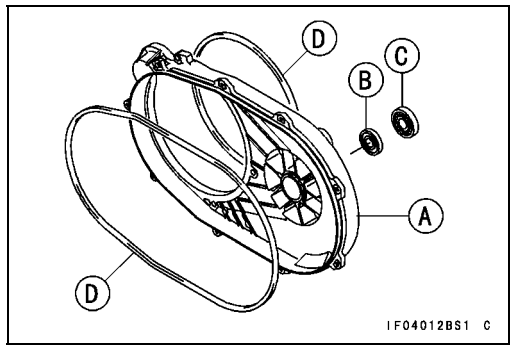
- Tighten the damper bracket nuts in the order as shown in the figure.
  Front [A]
  Outside [B]

Torque - Damper Bracket Nuts:
First: 20 N·m (2.0 kgf·m, 15 ft·lb)
Second: 44 N·m (4.5 kgf·m, 32 ft·lb)
Final: 59 N·m (6.0 kgf·m, 44 ft·lb)

- Install the removed parts (see appropriate chapters).

○Bleed the brake line after installing the left rear brake hose end (see Brake Line Air Bleeding in the Brakes chapter).

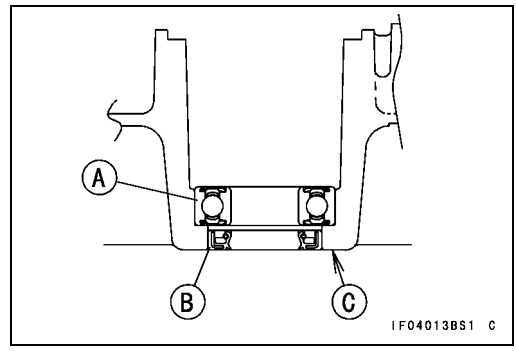
Torque Converter Case Disassembly



- Remove:
  Torque Converter Case [A] (see Torque Converter Case Removal)
  Oil Seal [B]
  Ball Bearing [C]
  Trims [D] (if necessary)

Torque Converter

Torque Converter Case Assembly



- Press the ball bearing [A] until it is bottomed.

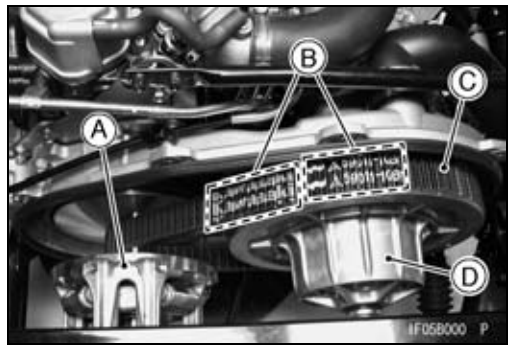
Special Tool - Bearing Driver Set: 57001-1129

- Apply grease to the oil seal lip.
- Press the oil seal [B] in the case so that the oil seal surface is flush [C] with the case end.

★When installing the trim, add the glue to the place between bolt hole and bolt hole.

Drive Belt

Drive Belt Removal



- Pull the parking brake lever up and to the rear to apply the parking brake.

⚠ WARNING

Wear gloves to protect your hands from sharp edges during the following steps.

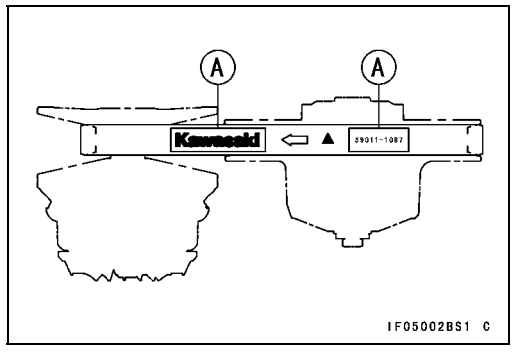
- Remove the drive pulley [A] (see Drive Pulley Removal).

NOTE

○*Before removing the drive belt, observe the direction of the belt's printed informations [B] (such as manufacturers name and arrow marks) is facing so that it may be reinstalled on the pulleys to rotate in the same direction as originally installed.*

- Lift the drive belt [C] off the driven pulley [D].

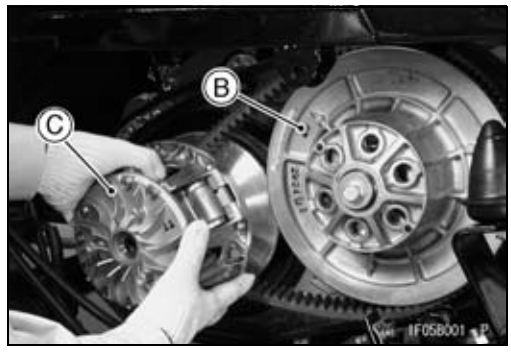
Drive Belt Installation



NOTE

○*Be sure the printed information faces the same direction so the belt rotates in the same direction as originally installed. When installing a new belt, install it so the printed information [A] can be read from beside the vehicle.*

- Installation is basically the reverse of removal.
- Loop the belt over the driven pulley [B].
- Install the drive pulley [C] (see Drive Pulley Installation).



- Put the transmission in neutral, and rotate the driven pulley to allow the belt to return to the top [A] of the sheaves, before measuring belt deflection.



Drive Belt Inspection

- Refer to the Drive Belt Inspection in the Periodic Maintenance chapter.

Drive Belt Deflection Inspection

- Refer to the Drive Belt Deflection Inspection in the Periodic Maintenance chapter.

Drive Belt

Drive Belt Deflection Adjustment

- Refer to the Drive Belt Deflection Adjustment in the Periodic Maintenance chapter.

Drive Pulley

Drive Pulley Removal

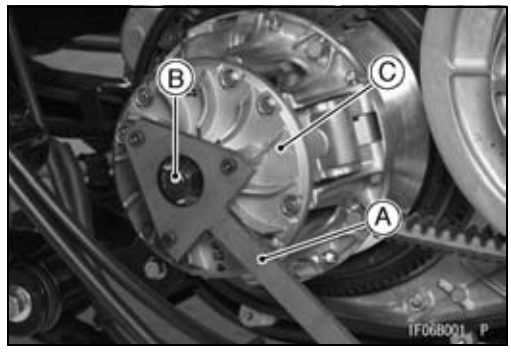
- Remove:
  Torque Converter Outer Cover (see Torque Converter Outer Cover Removal)
  Torque Cover Inner Cover (see Torque Cover Inner Cover Removal)
- Install the drive pulley holder [A] and tighten it with the three Allen bolts [B] as shown in the figure.

  Special Tool - Drive Pulley Holder: 57001-1548



- Remove the drive pulley bolt [C].
- Using the drive pulley holder [A] and drive pulley puller bolt [B], remove the drive pulley [C] from the crankshaft.

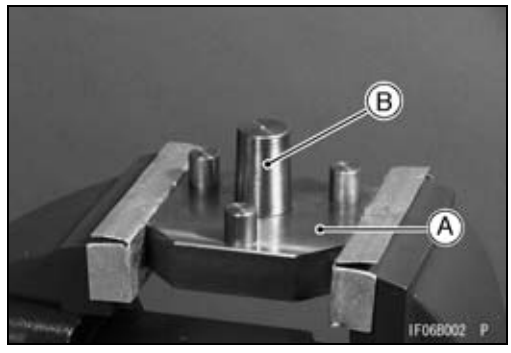
  Special Tools - Drive Pulley Puller Bolt: 57001-1429
  Drive Pulley Holder: 57001-1548



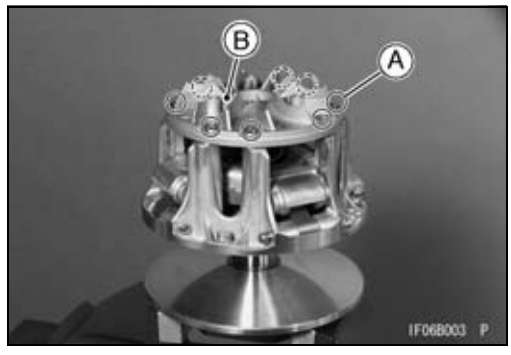
Drive Pulley Disassembly

- Hold the drive pulley holder [A] and drive & driven pulley holder [B] in a vise.

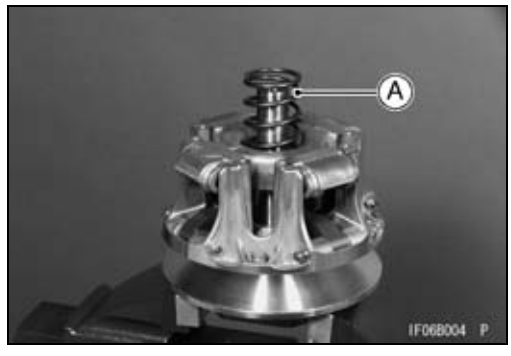
  Special Tools - Drive & Driven Pulley Holder: 57001-1412
  Drive & Driven Pulley Holder: 57001-1473



- Set the pulley onto the pulley holder.
- Remove:
  Drive Pulley Cover Bolts [A]
  Drive Pulley Cover [B]



- Remove the spring [A].

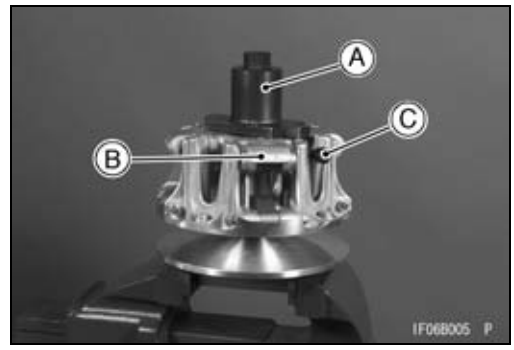


Drive Pulley

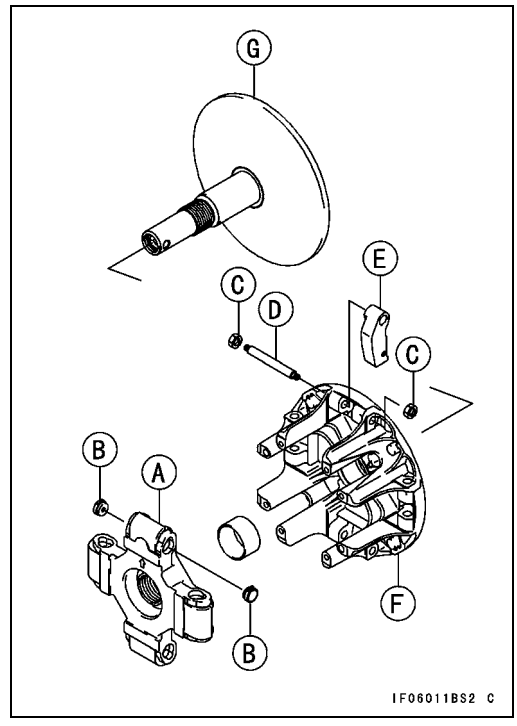
- Put the drive pulley wrench [A] on the spider [B] and tighten the bolt [C].

  Special Tool - Drive Pulley Wrench: 57001-1549

- Remove the spider with the movable sheave.

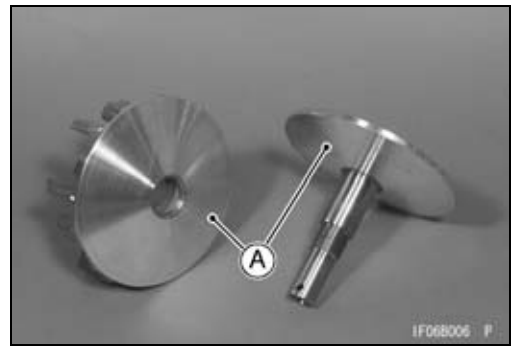


- Remove:
  Spider [A]
  Shoes [B]
  Nuts [C]
  Ramp Weight Pin [D]
  Ramp Weight [E]
  Movable Sheave [F]
  Fixed Sheave [G]

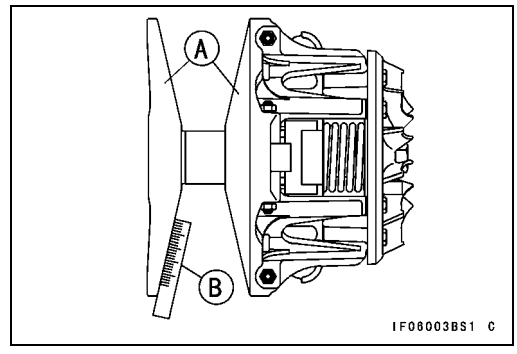


Drive Pulley Inspection

★If the sheave surfaces [A] appear damaged, replace the sheaves.



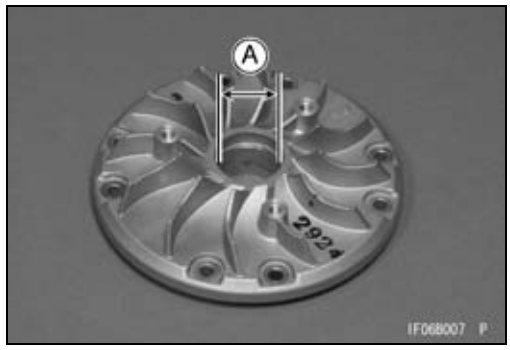
- Replace any sheave which has uneven wear on the belt contacting surface.
  Sheave Surfaces [A]
  Straight Edge [B]



Drive Pulley

★If the cover bushing is damaged or worn, replace the drive pulley cover.

Cover Bushing Inside Diameter [A]
Standard: 27.655 ~ 27.955 mm (1.089 ~ 1.101 in.)
Service Limit: 27.99 mm (1.102 in.)

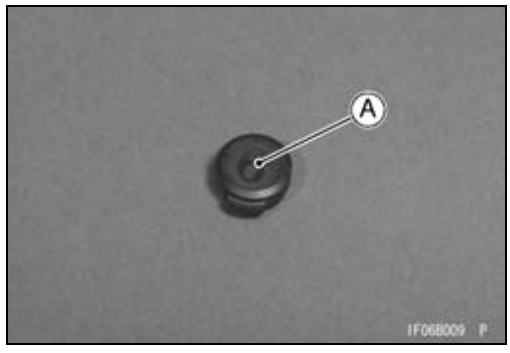


★If the sheave bushing is damaged or worn, replace it.

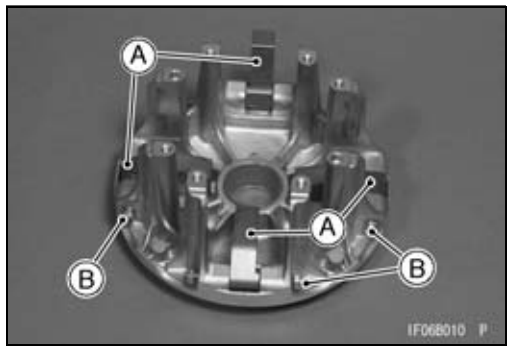
Sheave Bushing Inside Diameter [A]
Standard: 38.055 ~ 38.155 mm (1.498 ~ 1.502 in.)
Service Limit: 38.19 mm (1.504 in.)



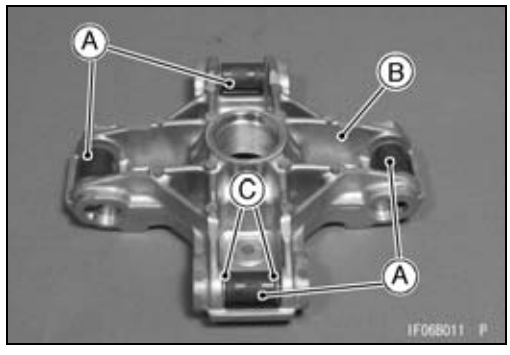
★If the spider shoes [A] are damaged, replace them.
● Check the spider shoe side clearance (see Spider Shoe Side Clearance Adjustment).



★If the ramp weights [A] are damaged or worn, replace them.
★If the pins [B] are damaged or worn, replace them.



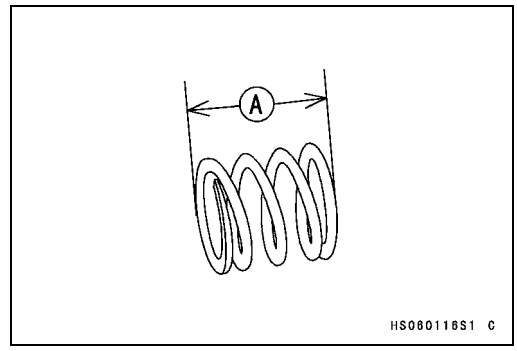
★If the rollers [A] are damaged or worn, replace the spider [B].
★If the washers [C] are damaged or worn, replace the spider.



Drive Pulley

★If the spring is damaged or worn, replace the spring.

Spring Free Length [A]
Standard: 77 mm (3.03 in.)
Service Limit: 75.6 mm (2.98 in.)

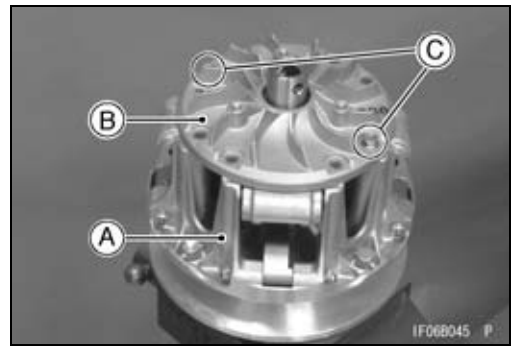


Spider Shoe Side Clearance Adjustment

- Remove:
  Drive Pulley (see Drive Pulley Removal)
  Drive Pulley Cover and Spring (see Drive Pulley Disassembly)
- Set the drive pulley [A] without the spring onto the pulley holders.

Special Tools - Drive & Driven Pulley Holder: 57001-1412
Drive & Driven Pulley Holder: 57001-1473

- Install the following parts temporarily.
  Dowel Pins
  Drive Pulley Cover [B]
  Two Bolts [C] (at Dowel Pins)



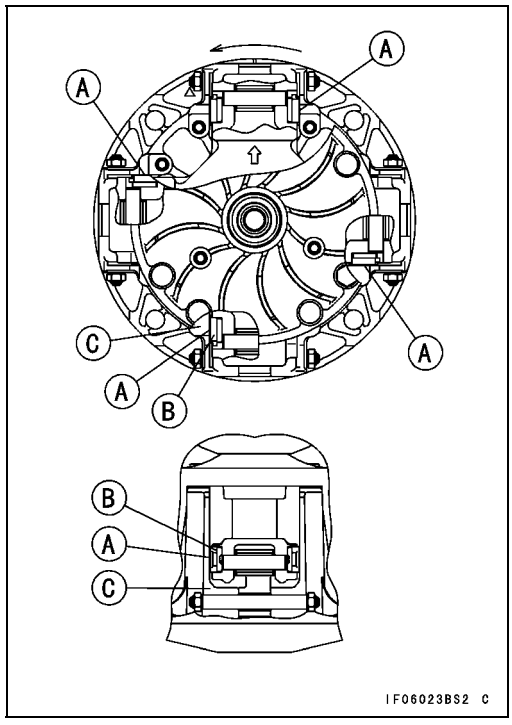
Drive Pulley

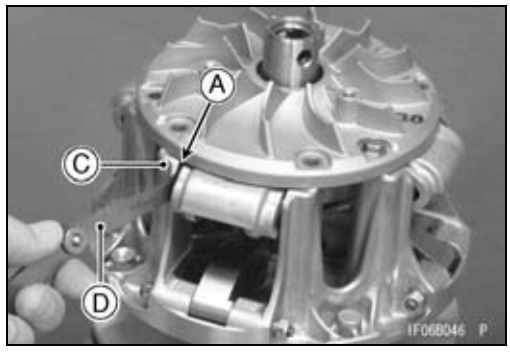
- Turn the spider counterclockwise.
- Measure the resulting clearance [A] between the shoe [B] and the post [C] on the movable sheave at four posts, using a thickness gauge [D].

Shoe Side Clearance
Standard: 0.05 ~ 0.20 mm (0.0020 ~ 0.0079 in.)

★If the clearance is not within the specified range, adjust it according to following chart.

Clearance Measurement	Present Shoes	
	Part Number	Thickness
up to 0.05 mm (0.0020 in.)	49048-1087	7.2 mm (0.283 in.)
	49048-1088	7.3 mm (0.287 in.)
	49048-1089	7.4 mm (0.291 in.)
over 0.05 to 0.20 mm (over 0.0020 to 0.0079 in.) (standard clearance)	no change (49048-1090)	(7.5 mm) (0.295 in.)
over 0.20 mm (0.0079 in.)	49048-1091	7.6 mm (0.299 in.)
	49048-1092	7.7 mm (0.303 in.)
	49048-1093	7.8 mm (0.307 in.)
	49048-1094	7.9 mm (0.311 in.)
	49048-1095	8.0 mm (0.315 in.)

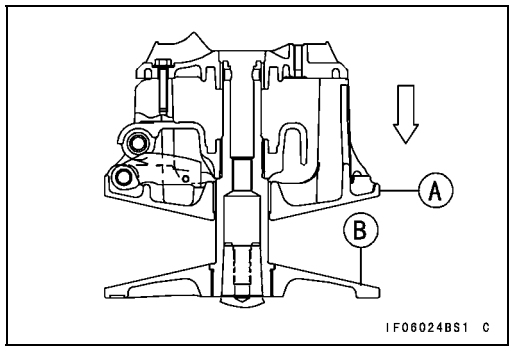




- Check that the movable sheave [A] moves smoothly, after the shoe side clearance adjustment.

○The movable sheave must move freely towards the fixed sheave [B].

★If the movable sheave does not move smoothly, readjust the shoe side clearance.



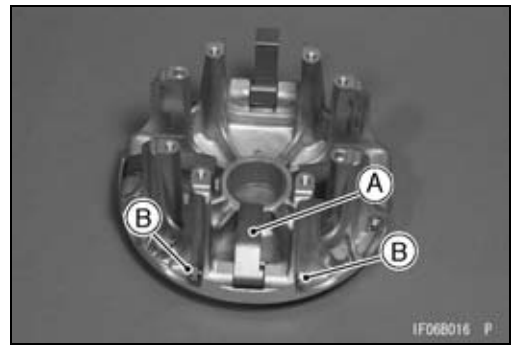
Drive Pulley

Drive Pulley Assembly

- Install the ramp weight [A] as shown in the figure.
- Tighten:

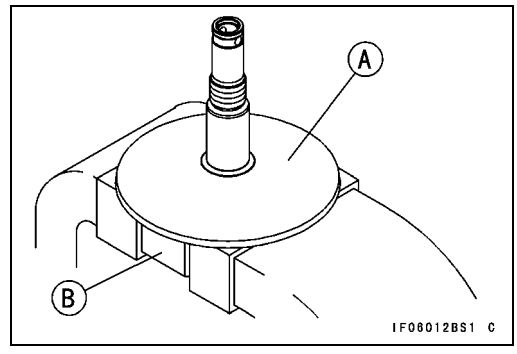
Torque - Ramp Weight Nuts [B]: 6.9 N·m (0.70 kgf·m, 61 in·lb)

- Check that the ramp weights swing smoothly.



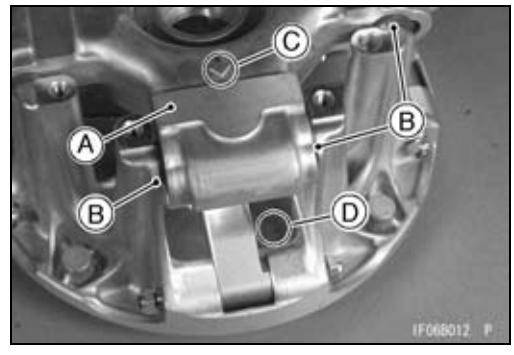
- Hold the fixed sheave [A] with the drive pulley holders [B] in a vise.

Special Tools - Drive & Driven Pulley Holder: 57001-1412
Drive & Driven Pulley Holder: 57001-1473



- Clean the threads of the fixed sheave and spider.
- Install:
  Movable Sheave
  Spider [A] and Shoes [B]

○Align the arrow [C] on the spider with the arrow [D] on the movable sheave.
○Insert the shoes so that the rubber side faces inward.

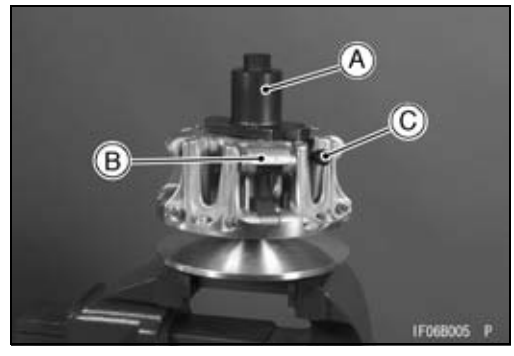


- Put the drive pulley wrench [A] on the spider [B] and tighten the bolt [C].

Special Tool - Drive Pulley Wrench: 57001-1549

- Turn the wrench for tightening.

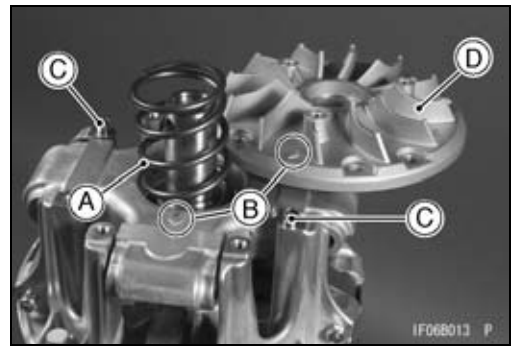
Torque - Spider: 275 N·m (28.0 kgf·m, 203 ft·lb)



- Put the spring [A] in the groove of the spider.
- Align the arrows [B] on the drive pulley cover and spider.
- Install:
  Dowel Pins [C]
  Drive Pulley Cover [D]
- Tighten:

Torque - Drive Pulley Cover Bolts: 13 N·m (1.3 kgf·m, 115 in·lb)

- Clean the surface of the sheaves with an oil-less cleaning fluid.

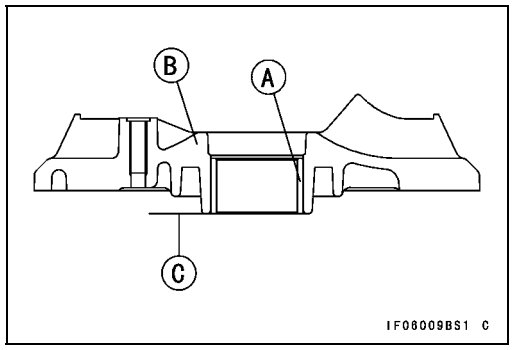


Drive Pulley

Bushing Installation

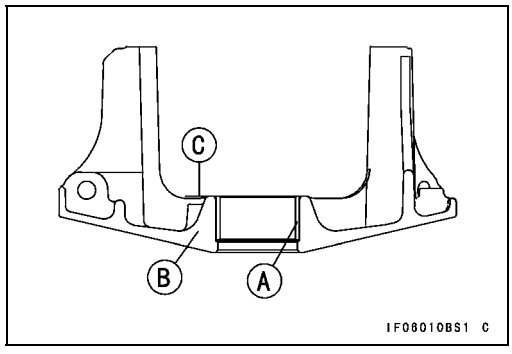
- Press the cover bushing [A] into the cover [B] using the special tool so that the end of bushing is flush with the shoulder [C] in the hole.

  Special Tool - Bearing Driver Set: 57001-1129



- Press the sheave bushing [A] into the movable sheave [B] using the special tool so that the end of bushing is flush with the shoulder [C] in the hole.

  Special Tool - Bearing Driver Set: 57001-1129

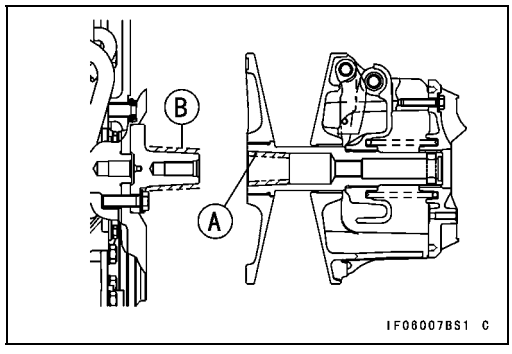


Drive Pulley Installation

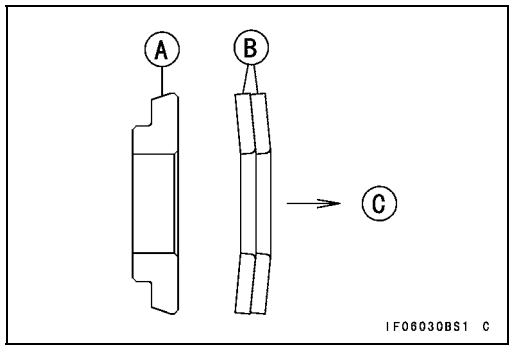
- Clean the following portions with an oil-less cleaning fluid such as trichloroethylene or acetone, and wipe off any oil with a clean cloth from the tapers.
  Fixed Sheave Tapered Portion [A]
  Crankshaft Tapered Portion [B]

⚠ WARNING

These cleaning fluids are usually highly flammable and harmful if breathed for prolonged periods. Be sure to heed the fluid manufacturer's warnings.



- Install the drive pulley, and screw in the drive pulley bolt with the stepped collar [A] and washers [B] as shown in the figure.
  Bolt Head [C]

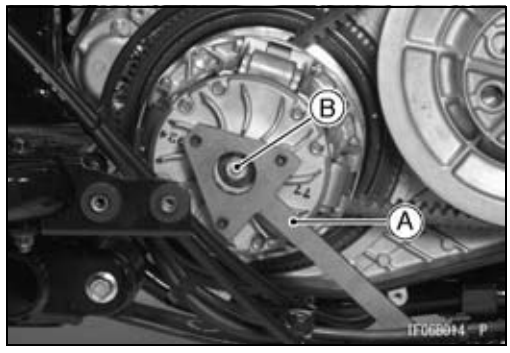


- Hold the drive pulley with the drive pulley holder [A].

  Special Tool - Drive Pulley Holder: 57001-1548

- Tighten:

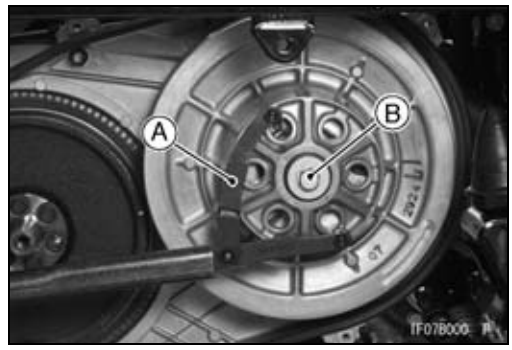
  Torque - Drive Pulley Bolt [B]: 93 N·m (9.5 kgf·m, 69 ft·lb)



- Install the torque converter outer cover (see Torque Converter Outer Cover Installation).

Driven Pulley

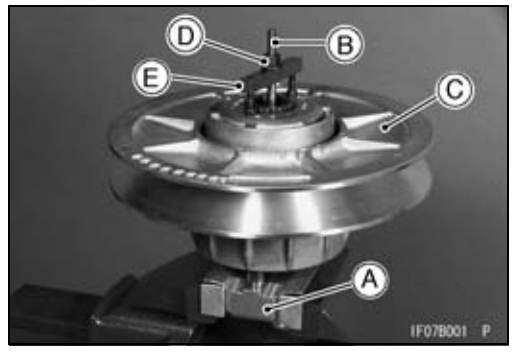
Driven Pulley Removal



- Remove:
  Drive Pulley (see Drive Pulley Removal)
  Drive Belt (see Drive Belt Removal)
- Using a flywheel & pulley holder [A], remove the driven pulley bolt [B] and stepped collar.

  Special Tool - Flywheel & Pulley Holder: 57001-1605
- Remove the driven pulley.

Driven Pulley Disassembly

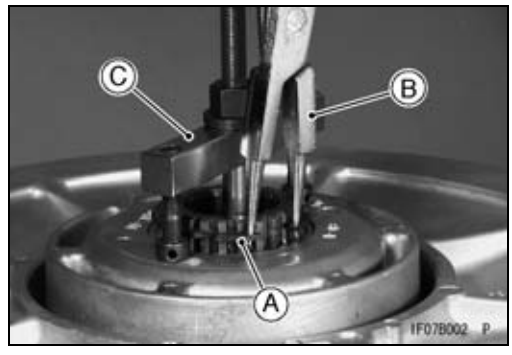


- Hold the drive & driven pulley holder [A] in a vise.

  Special Tool - Drive & Driven Pulley Holder: 57001-1412
- Screw the guide bar [B] of the driven pulley holder into the holder.

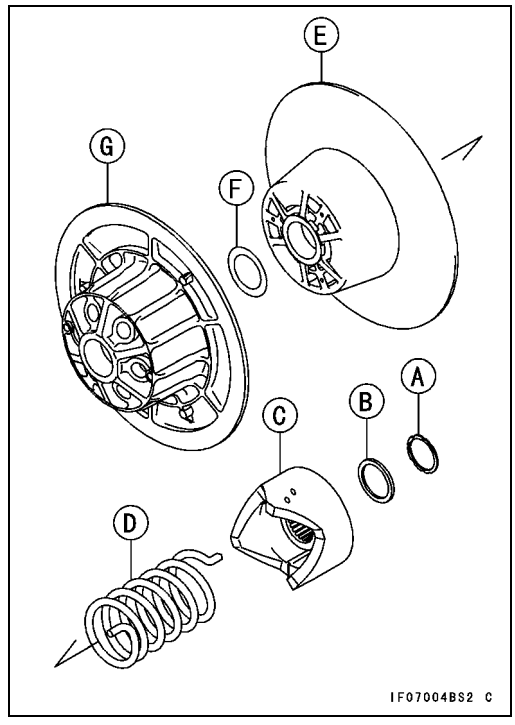
  Special Tool - Driven Pulley Holder: 57001-1465
- Put the driven pulley [C] on the guide bar.
- Tighten the nut [D], and compress the spring with the spring holder [E] of the driven pulley holder.

  Special Tool - Driven Pulley Holder: 57001-1465



- Remove the circlip [A] with circlip pliers [B].

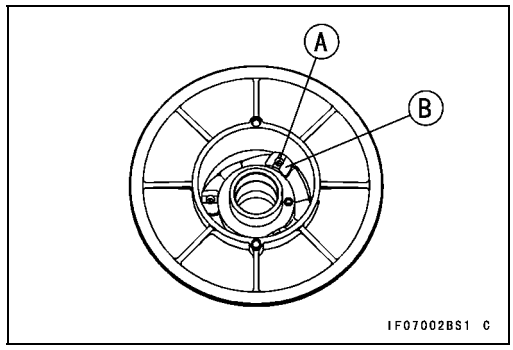
  Special Tool - Outside Circlip Pliers: 57001-144
- Remove the nut and spring holder [C].



- Remove:
  Circlip [A]
  Washer [B]
  Ramp [C]
  Spring [D]
  Movable Sheave [E]
  Spacer [F]
  Fixed Sheave with Shaft [G]

Driven Pulley

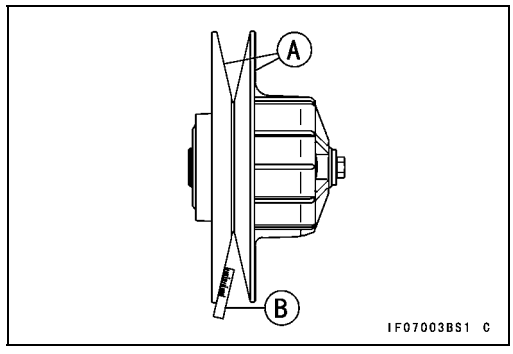
- Remove:
  Wear Shoe Mounting Screws [A]
  Wear Shoes [B]



Driven Pulley Inspection

★If the sheave surfaces [A] appear damaged, replace the sheaves.

- Replace any sheave which has uneven wear on the belt contacting surface.
  Straight Edge [B]



★If the guide bushings [A] are damaged or worn, replace the movable sheave.

Sheave Bushing Inside Diameter
Standard: 39.655 ~ 39.965 mm (1.561 ~ 1.573 in.)
Service Limit: 40 mm (1.57 in.)



★If the splines [A] of the fixed sheave and ramp are damaged or worn, replace them.



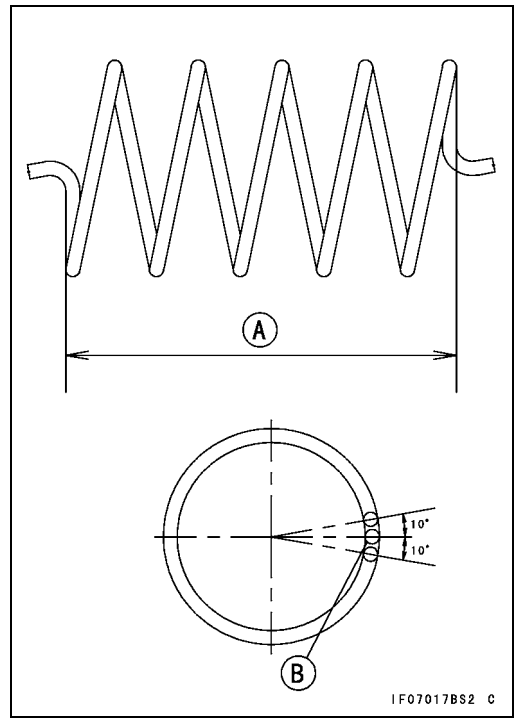


Driven Pulley

★If the spring is damaged or worn, replace the spring.

Spring Free Length [A]
Standard: 137.5 mm (5.41 in.)
Service Limit: 130.4 mm (5.13 in.)

★If the tabs on the spring are misaligned or the spring coils are distorted, replace the spring.
○One side end [B] of the spring must be maintained to ±10° from other side end.



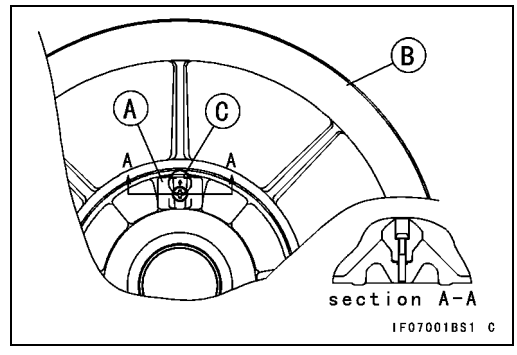
Converter Driven Pulley Shoe Inspection

● Refer to the Converter Driven Pulley Shoe Inspection in the Periodic Maintenance chapter.

Driven Pulley Assembly

● Install the wear shoes [A] on the movable sheave [B] as shown in the figure.
○The wear shoe shall be installed so that the mark [C] on the shoe faces outward.
● Apply a non-permanent locking agent to the wear shoe mounting screws.
● Tighten:

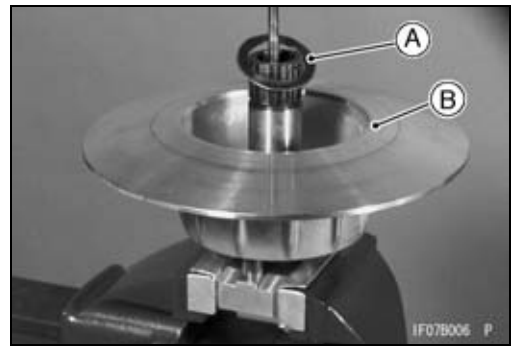
Torque - Wear Shoe Mounting Screws: 1.1 N·m (0.11 kgf·m, 10 in·lb)



● Hold the fixed sheave with the drive & driven pulley holder and driven pulley holder in a vise.

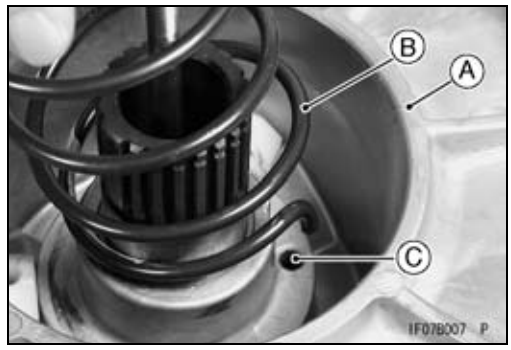
Special Tools - Drive & Driven Pulley Holder: 57001-1412
Driven Pulley Holder: 57001-1465

● Install the spacer(s) [A] on the fixed sheave [B].

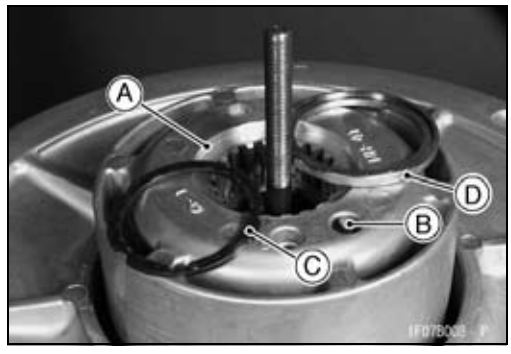


Driven Pulley

● Install:
Movable Sheave [A]
Spring [B]
○Insert the spring end into the hole [C] on the movable sheave.



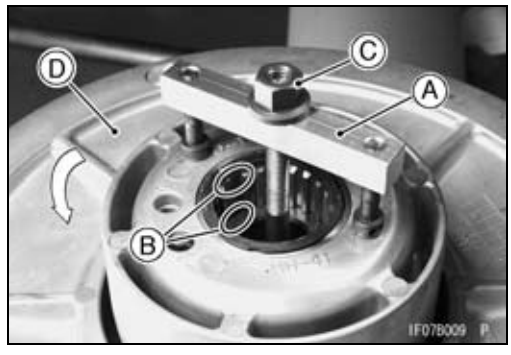
● Install the ramp [A] on the fixed sheave shaft.
● Insert the spring end [B] into the hole “1” on the ramp.
● Put the washer [C] and circlip [D] on the ramp.
○The washer shall be installed so that the recess of it faces outward.



● Install the spring holder [A].
● Align the flat portions [B] of spline of the fixed sheave and ramp, and push down the ramp halfway by tightening the flange nut [C].
● Hold the movable sheave [D] by turning it counterclockwise 120º and tighten the flange nut until the bottom of ramp hits the movable sheave.
● Install the washer and circlip.

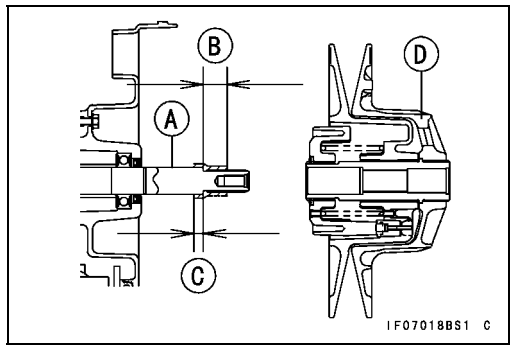
Special Tool - Outside Circlip Pliers: 57001-144

● Release the movable sheave slowly until it stops naturally.

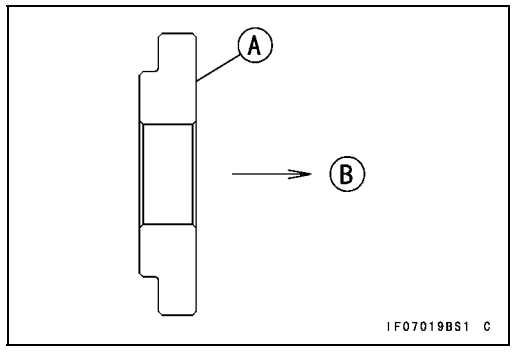


Driven Pulley Installation

● Clean the transmission driven shaft [A], and apply molybdenum disulfide grease width the specified range on it.
20 ~ 25 mm (0.79 ~ 0.98 in.) [B]
5 ~ 10 mm (0.20 ~ 0.39 in.) [C]
○Apply molybdenum disulfide grease thinly in the area [C].
● Install the driven pulley [D].



● Install the stepped collar [A] on the pulley as shown in the figure.
Bolt Head [B]

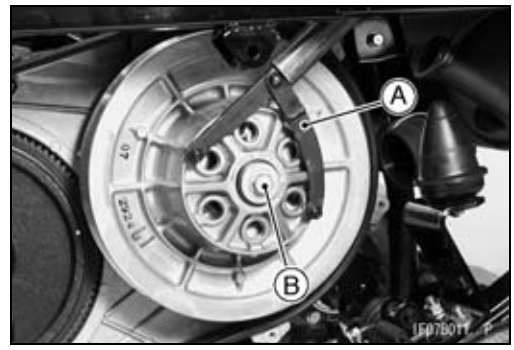


Driven Pulley

- Apply a non-permanent locking agent to the threads of the driven pulley bolt.
- Using a flywheel & pulley holder [A], tighten the driven pulley bolt [B].

  Special Tool - Flywheel & Pulley Holder: 57001-1605

  Torque - Driven Pulley Bolt: 93 N·m (9.5 kgf·m, 69 ft·lb)
- Install the removed parts (see appropriate chapters).

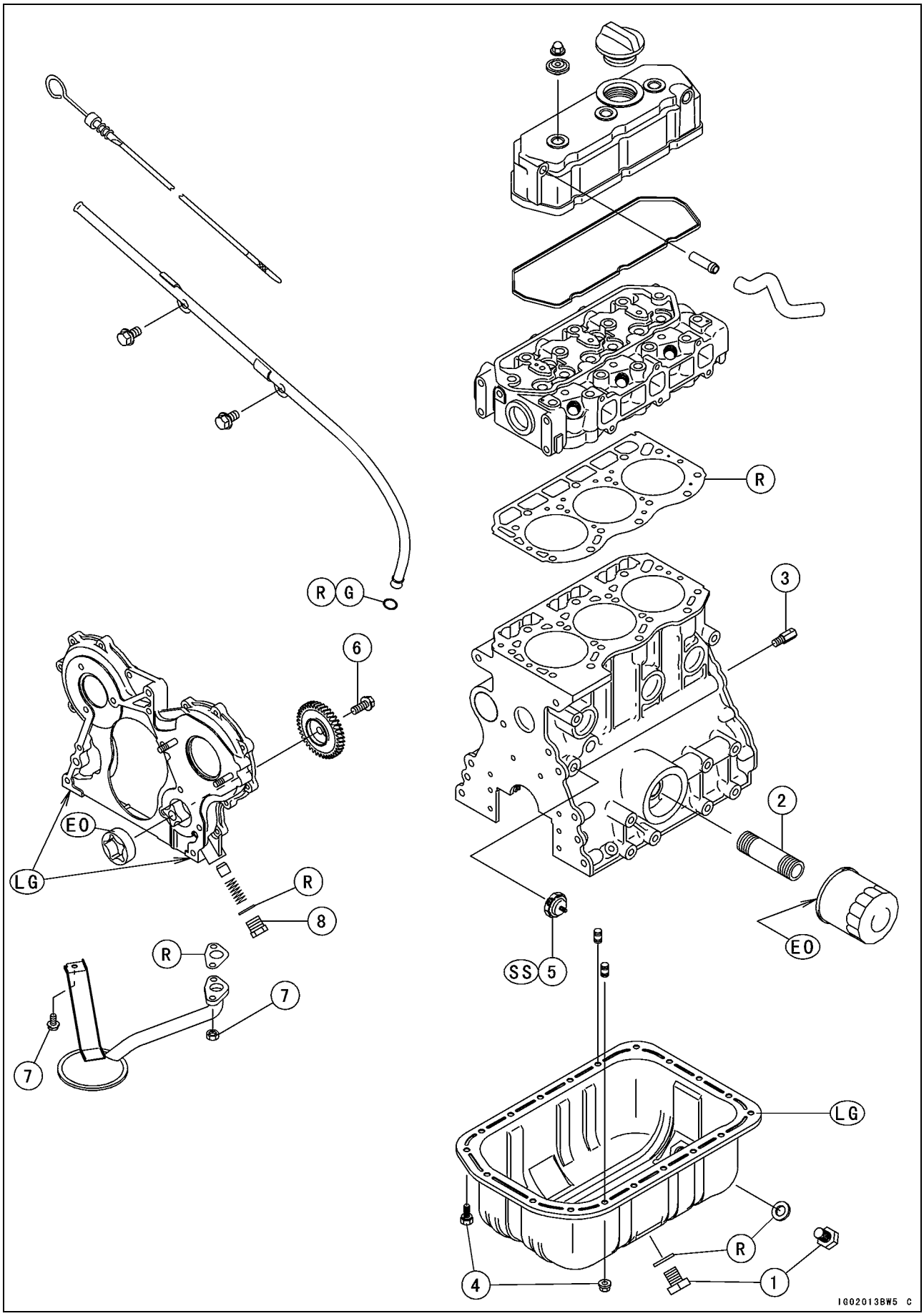


Engine Lubrication System

Table of Contents

Exploded View 7-2
Specifications 7-4
Special Tools and Sealant 7-5
Engine Oil Flow Chart 7-6
Engine Oil and Oil Filter 7-7
  Oil Level Inspection 7-7
  Engine Oil and/or Oil Filter Change 7-8
  Oil Filter Removal 7-8
  Oil Filter Installation 7-8
Oil Pan and Oil Strainer 7-9
  Oil Pan and Oil Strainer Removal 7-9
  Oil Pan and Oil Strainer Installation 7-9
  Oil Strainer Cleaning/Inspection 7-9
Oil Pump 7-10
  Oil Pump Removal 7-10
  Oil Pump Installation 7-10
  Oil Pump Inspection 7-10
Relief Valve 7-11
  Relief Valve Removal 7-11
  Relief Valve Installation 7-11
  Relief Valve Inspection 7-11
Oil Pressure Measurement 7-12
  Oil Pressure Measurement 7-12
Oil Pressure Switch 7-13
  Oil Pressure Switch Removal 7-13
  Oil Pressure Switch Installation 7-13
Oil Nozzle 7-14
  Oil Nozzle Installation 7-14

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Oil Drain Plugs	34	3.5	25	
2	Oil Filter Stud Bolt	44	4.5	32	
3	Oil Nozzle	14	1.4	10	
4	Oil Pan Bolts and Nuts	7.8	0.80	69 in·lb	
5	Oil Pressure Switch	14	1.4	10	SS
6	Oil Pump Drive Gear Bolt	20	2.0	15	
7	Oil Strainer Mounting Bolt and Nuts	7.8	0.80	69 in·lb	
8	Relief Valve Bolt	39	4.0	29	

EO: Apply engine oil.
G: Apply grease.
LG: Apply liquid gasket.
R: Replacement Parts
SS: Apply silicone sealant.

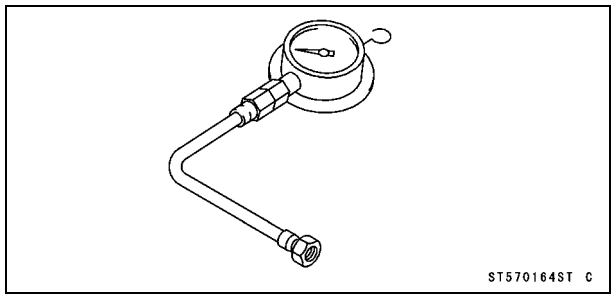
7-4 ENGINE LUBRICATION SYSTEM

Specifications

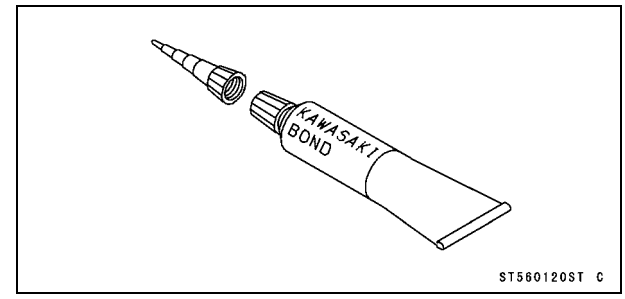
Item	Standard	Service Limit
Engine Oil and Oil Filter		
Engine Oil:		
Grade	API CF or CF-4	– – –
Viscosity	SAE 10W-40	– – –
Capacity	3.0 L (3.2 US qt)	– – –
	(When filter is not removed)	
	3.3 L (3.5 US qt)	– – –
	(When filter is removed)	
Level	Between F and L marks on dipstick	– – –
Oil Pump		
Oil Pump Side Clearance	0.030 ~ 0.096 mm (0.0012 ~ 0.0038 in.)	0.15 mm (0.0059 in.)
Oil Pump Housing Depth	12.63 ~ 12.67 mm (0.4972 ~ 0.4988 in.)	12.72 mm (0.5008 in.)
Relief Valve		
Relief Valve Spring Free Length	34.5 ~ 36.5 mm (1.358 ~ 1.437 in.)	– – –
Oil Pressure Measurement		
Oil Pressure	196 ~ 490 kPa (2.0 ~ 5.0 kgf/cm², 28 ~ 71 psi) at 3 000 r/min (rpm), Oil temperature 55 ~ 65°C (131 ~ 149°F)	– – –

Special Tools and Sealant

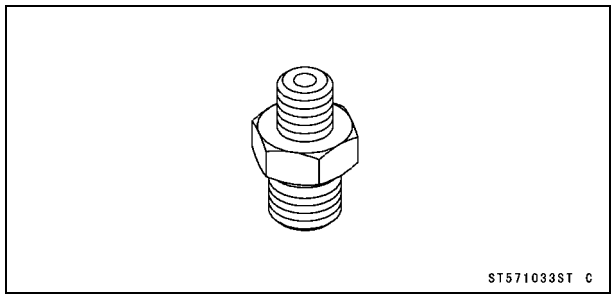
Oil Pressure Gauge, 10 kgf/cm²:
57001-164



Kawasaki Bond (Silicone Sealant):
56019-120



Oil Pressure Gauge Adapter, PT 1/8:
57001-1033



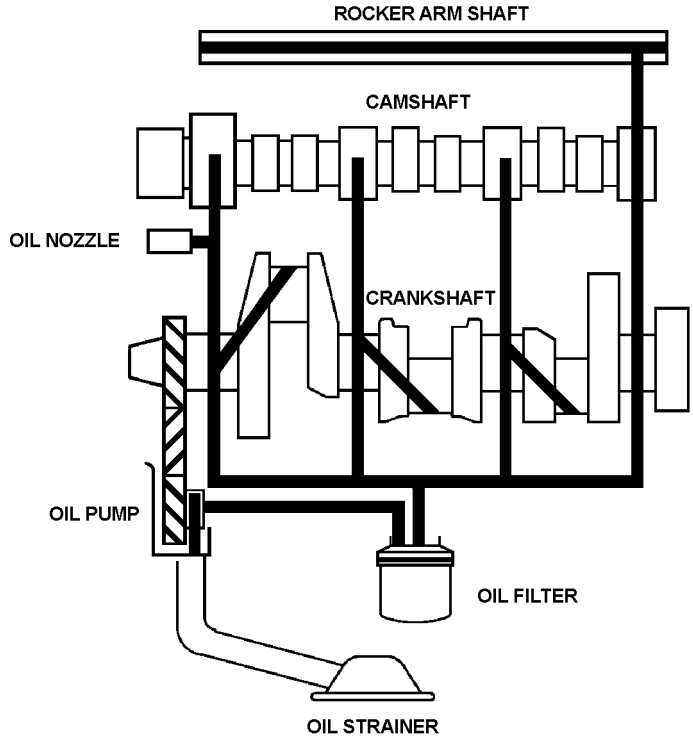
7-6 ENGINE LUBRICATION SYSTEM

Engine Oil Flow Chart

This engine has a full pressure lubrication system with an oil filter. The gear driven oil pump draws oil from a screened oil pickup in the oil pan and pumps the oil through the oil filter.

The filtered oil flows through oil galleries in the crankcase and is distributed to the main bearings, connecting rod bearings, camshaft bearings and rocker arm shaft.

A pressure relief valve limits the maximum oil pressure in the system.



Engine Oil and Oil Filter

⚠ WARNING

Vehicle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine seizure, accident, and injury.

Oil Level Inspection

NOTE

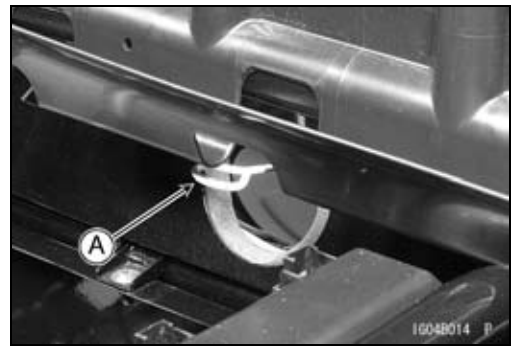
○*If the vehicle has just been used, wait several minutes for all the oil to drain down.*

○*If the oil has just been changed, start the engine and run it for several minutes at idle speed. This fills the oil filter with oil. Stop the engine, then wait several minutes until the oil settles.*

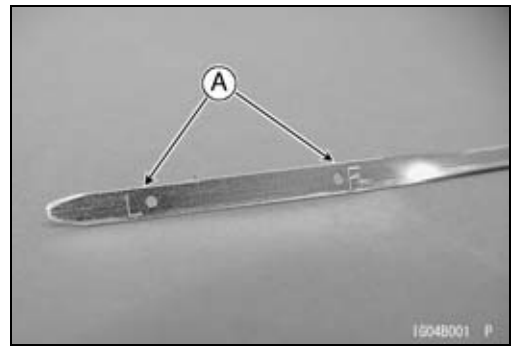
CAUTION

Racing the engine before the oil reaches every part can cause engine seizure.

● Park the vehicle on level ground, and tilt up the seat.
● Pull out the dipstick [A] out of the dipstick tube, wipe it dry, and insert it into the tube securely.



● Pull out the dipstick and check the oil level. The oil level should be between the upper (F) and lower (L) level marks [A].
★If the oil level is too high, remove the excess oil. Remove the dipstick pipe, and using a syringe or some other suitable device through the opening, or removing the engine oil drain plug, drain the excess oil.



★If the oil level is too low, add the correct amount of oil through the oil filler opening. Use the same type and make of oil that is already in the engine.
Oil Filler Cap [A]



NOTE

○*If the engine oil type and make are unknown, use any brand of the specified oil to top up the level in preference to running the engine with the oil level low. Then at your earliest convenience, change the oil completely.*

CAUTION

To avoid the engine damage, do not fill the engine oil above the full level.

Engine Oil and Oil Filter

Engine Oil and/or Oil Filter Change

- Refer to the Engine Oil and/or Oil Filter Change in the Periodic Maintenance chapter.

Oil Filter Removal

- Refer to the Oil Filter Removal in the Periodic Maintenance chapter.

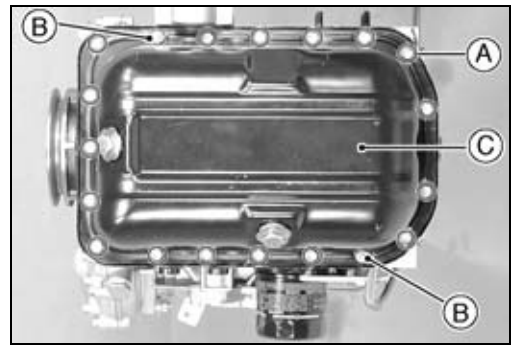
Oil Filter Installation

- Refer to the Oil Filter Installation in the Periodic Maintenance chapter.

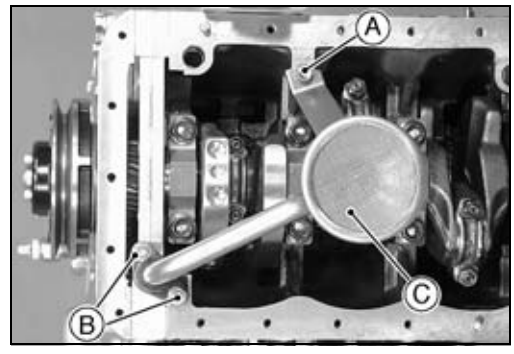
Oil Pan and Oil Strainer

Oil Pan and Oil Strainer Removal

- Remove:
  Engine (see Engine Removal in the Engine Removal/Installation chapter)
  Flywheel and End Plate (see End Plate Removal in the Crankshaft/Crankcase chapter)
  Oil Pan Bolts [A] and Nuts [B]
- Remove the oil pan [C] straight so that the baffle plate in the oil pan does not to hitch the oil strainer.



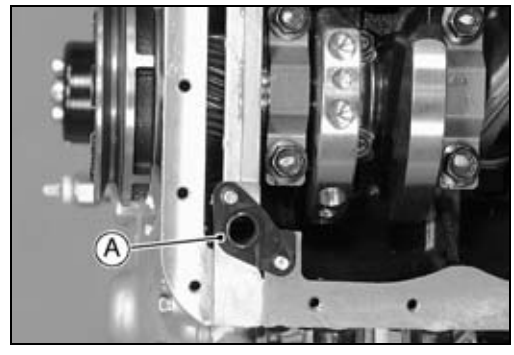
- Remove:
  Oil Strainer Mounting Bolt [A] and Nuts [B]
  Oil Strainer [C]



Oil Pan and Oil Strainer Installation

- Clean the oil pan and oil strainer thoroughly whenever they are removed.
- Replace the oil strainer gasket [A] with a new one.
- Tighten:

Torque - Oil Strainer Mounting Bolt and Nuts: 7.8 N·m (0.80 kgf·m, 69 in·lb)

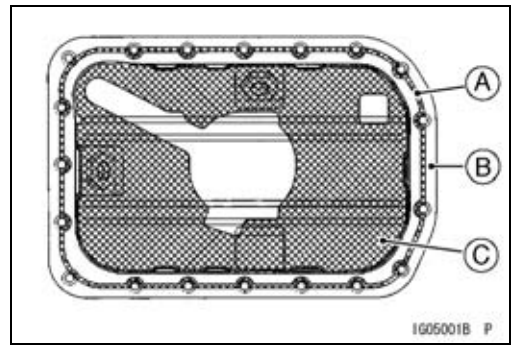


- Apply liquid gasket [A] to the mating surface as shown in the figure.

Sealant - Three Bond: 1207F

- Install the oil pan [B] so that the baffle plate [C] does not hitch the oil strainer.
- Tighten:

Torque - Oil Pan Bolts and Nuts: 7.8 N·m (0.80 kgf·m, 69 in·lb)



Oil Strainer Cleaning/Inspection

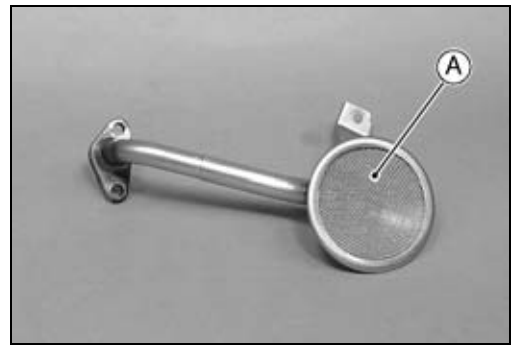
- Clean the oil strainer, and remove any particles stuck to it.

NOTE

○*While cleaning the strainer, check for any metal particles that might indicate internal engine damage.*

- Check the screen [A] carefully for any damage: holes and broken wire.

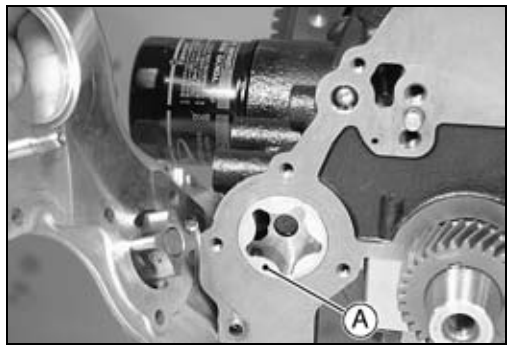
★If the screen is damaged, replace the oil strainer.



Oil Pump

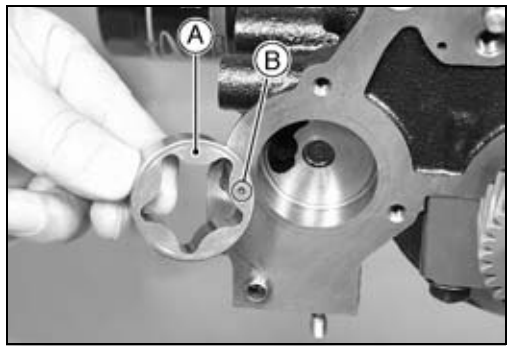
Oil Pump Removal

- Remove:
  Timing Gear Case (see Timing Gear Case Removal in the Crankshaft/Crankcase chapter)
  Oil Pump Outer Rotor [A]



Oil Pump Installation

- Clean and lubricate the oil pump outer rotor [A] with engine oil.
- Install the oil pump outer rotor with the punch mark [B] facing inside.
- Install the timing gear case (see Timing Gear Case Installation in the Crankshaft/Crankcase chapter).



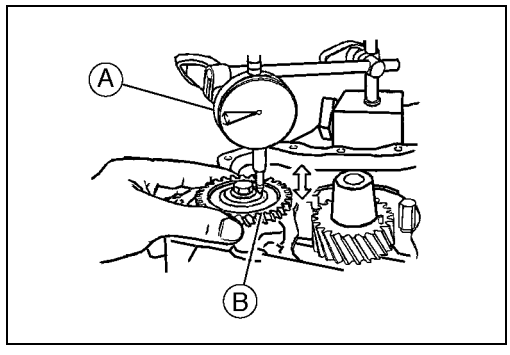
Oil Pump Inspection

- Remove the timing gear case cover (see Timing Gear Case Removal in the Crankshaft/Crankcase chapter).
- Set up a dial gauge [A] against the oil pump gear [B] as shown in the figure and measure the oil pump side clearance.

Oil Pump Side Clearance

Standard:	**0.030 ~ 0.096 mm (0.0012 ~ 0.0038 in.)**
Service Limit:	**0.15 mm (0.0059 in.)**

★If the clearance exceeds the service limit, go to next procedure.

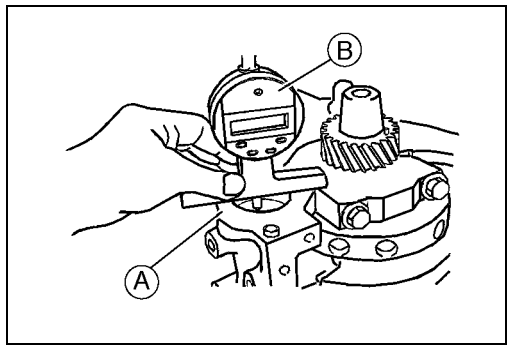


- Remove the oil pump outer rotor (see Oil Pump Removal).
- Measure the depth of the pump housing in the crankcase [A] with a depth micrometer [B] at several points.

Oil Pump Housing Depth

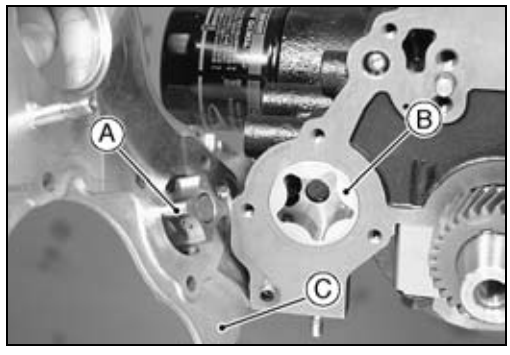
Standard:	**12.63 ~ 12.67 mm (0.4972 ~ 0.4988 in.)**
Service Limit:	**12.72 mm (0.5008 in.)**

★If the depth exceeds the service limit, replace the crankcase.
★If the depth within the service limit, replace the timing gear case.



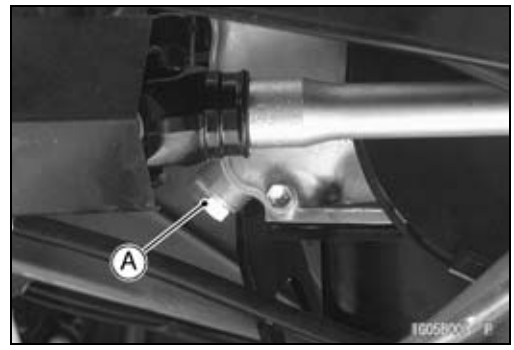
- Visually inspect the oil pump inner rotor [A] and outer rotor [B].

★If there is any damage or uneven wear, replace the timing gear case [C].



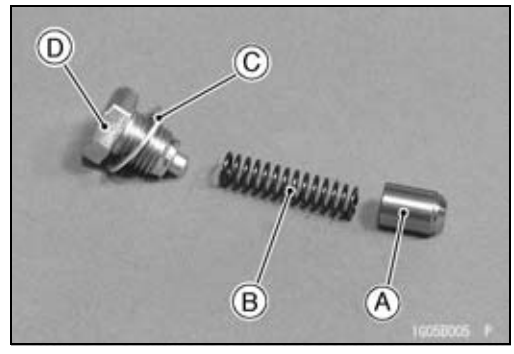
Relief Valve

Relief Valve Removal



- Drain the engine oil (see Engine Oil and/or Oil Filter Change in the Periodic Maintenance chapter).
- Remove:
  Relief Valve Bolt [A] and Washer
  Relief Valve Spring
  Relief Valve Plunger

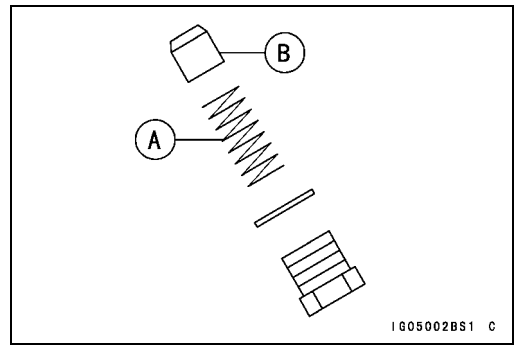
Relief Valve Installation



- Install:
  Relief Valve Plunger [A]
  Relief Valve Spring [B]
  Washer [C] and Relief Valve Bolt [D]
- Tighten:

Torque - Relief Valve Bolt: 39 N·m (4.0 kgf·m, 29 ft·lb)

Relief Valve Inspection



- Visually inspect the relief valve spring [A] and plunger [B].

★If any nicks or burrs are found during the above inspection, replace the parts.

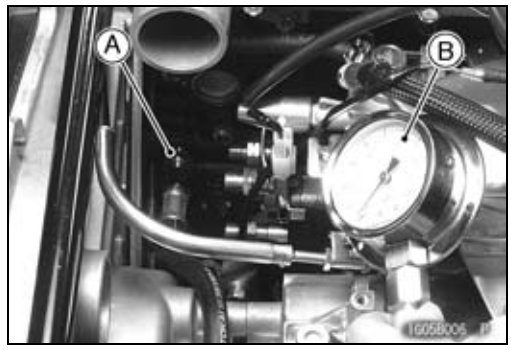
- Measure the relief valve spring free length.

★If the spring is shorter than the standard, replace the spring.

Relief Valve Spring Free Length
Standard: 34.5 ~ 36.5 mm (1.358 ~ 1.437 in.)

Oil Pressure Measurement

Oil Pressure Measurement



- Remove the oil pressure switch (see Oil Pressure Switch Removal).
- Attach the adapter [A] and gauge [B] to the hole.

Special Tools - Oil Pressure Gauge,10kgf/cm²: 57001-164
Oil Pressure Gauge Adapter, PT 1/8: 57001 -1033

- Install the removed parts (see appropriate chapters).

- Start the engine and warm up the engine.
- Run the engine at the specified speed, and read the oil pressure gauge.

Oil Pressure
Standard: 196 ~ 490 kPa (2.0 ~ 5.0 kgf/cm², 28 ~ 71 psi) at 3 000 r/min (rpm), oil temperature 55 ~ 65°C (131 ~ 149°F)

- Stop the engine.
- Remove the oil pressure gauge and adapter.

⚠ WARNING

Take care against burns from hot engine oil that will drain through the oil passage when the gauge adapter is removed.

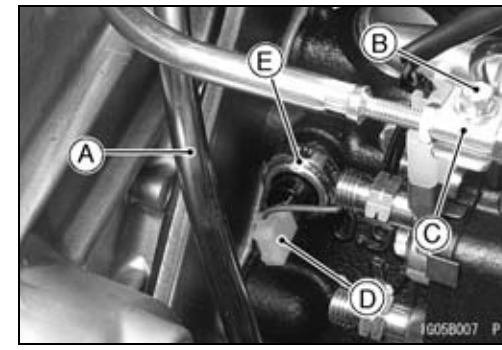
- Install the oil pressure switch (see Oil Pressure Switch Installation).

Troubleshooting Guide

Low Oil Pressure	High Oil Pressure
Engine RPM too low	Wrong viscosity oil
Wrong viscosity or diluted oil	Plugged oil galleries
Low oil level	
Broken relief valve spring	
Missing relief valve plunger	
Worn bearings	
Damaged or defective oil pump	

Oil Pressure Switch

Oil Pressure Switch Removal



- Drain the engine oil (see Engine Oil and/or Oil Filter Change in the Periodic Maintenance chapter).
- Remove:
  Fuel Injection Pipes (see Fuel Injection Pipe Removal in the Fuel System chapter)
  Oil Level Gauge Pipe [A] (see End Plate Removal in the Crankshaft/Crankcase chapter)
  Screw [B]
  Plate [C]
  Switch Connector [D]
  Oil Pressure Switch [E]

Oil Pressure Switch Installation

- Apply silicone sealant to the threads of the oil pressure switch and tighten it.

  Sealant - Kawasaki Bond (Silicone Sealant): 56019-120

  Torque - Oil Pressure Switch: 14 N·m (1.4 kgf·m, 10 ft·lb)
- Install the removed parts (see appropriate chapters).

Oil Nozzle

Oil Nozzle Installation

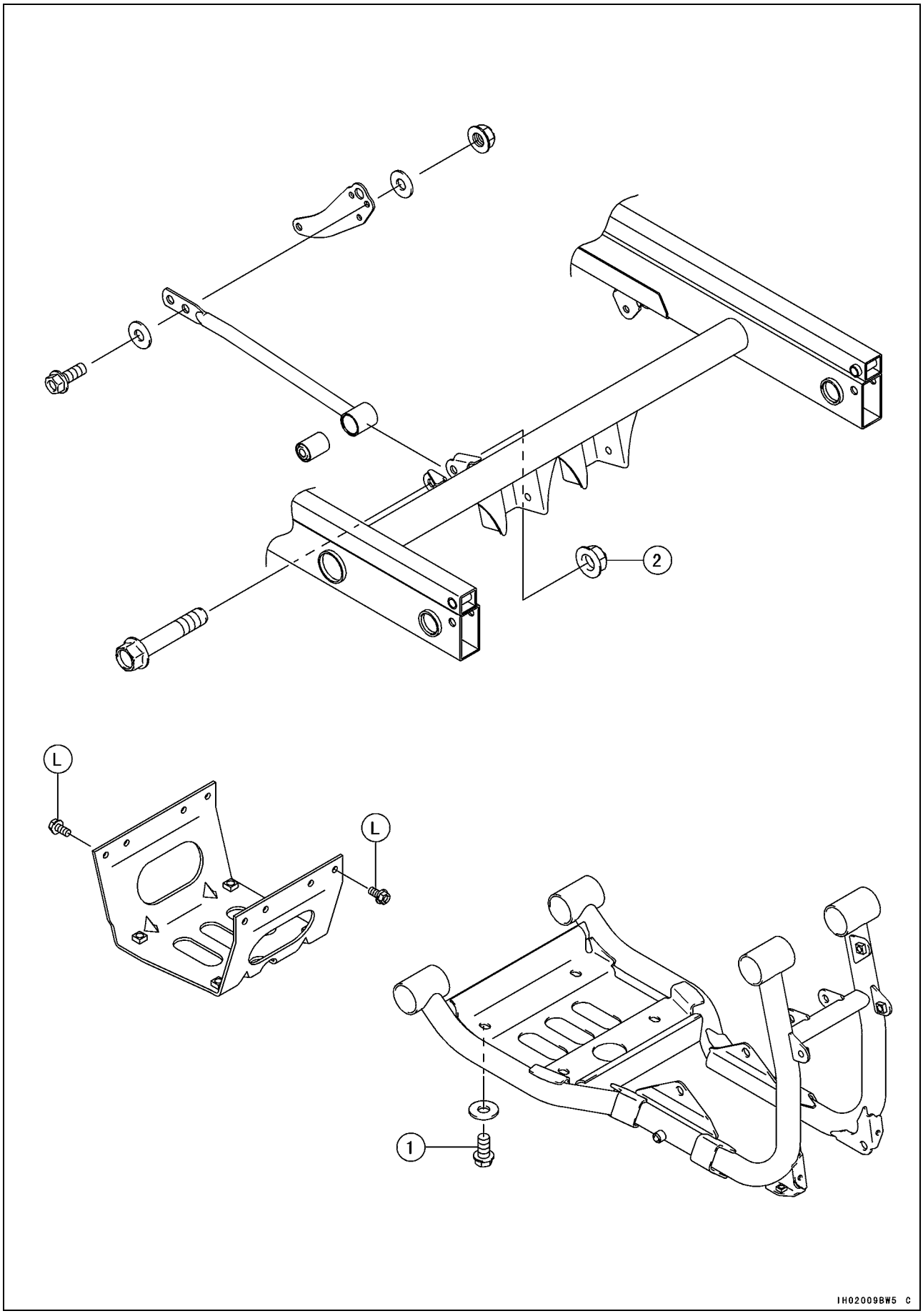
- Refer to the Timing Gear Case Installation in the Crankshaft/Crankcase chapter.

Engine Removal/Installation

Table of Contents

Exploded View 8-2
Special Tool 8-4
Engine Removal/Installation 8-5
Engine Removal 8-5
Engine Installation 8-7

Exploded View



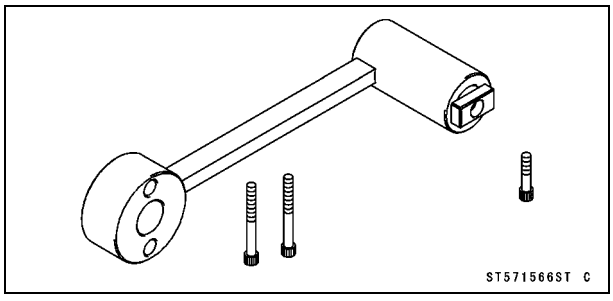
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Mounting Bolts	44	4.5	32	
2	Stay Rod Rear Nut	88	9.0	65	

L: Apply a non-permanent locking agent.

Special Tool

Assembly Jig:
57001-1566



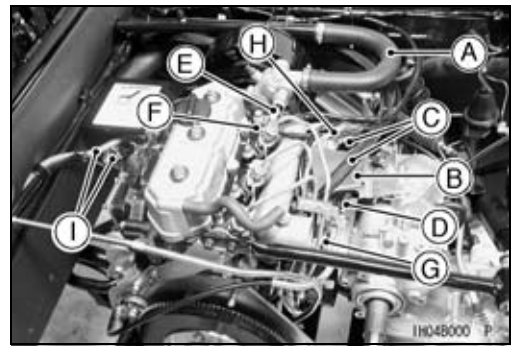
Engine Removal/Installation

Engine Removal

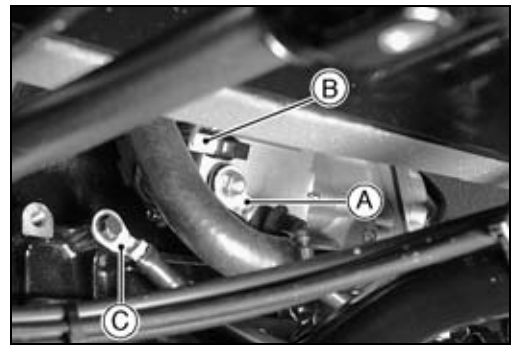
- Disconnect the battery cables (see Battery Removal in the Electrical System chapter).
- Drain:
  Engine Oil (see Engine Oil and/or Oil Filter Change in the Periodic Maintenance chapter)
  Coolant (see Coolant Change in the Periodic Maintenance chapter)

○Drain the coolant from the cylinder head if necessary (see Cylinder Head Removal in the Engine Top End chapter).

- Remove:
  Cargo Bed (see Cargo Bed Removal in the Frame chapter)
  Torque Converter Case (see Torque Converter Case Removal in the Converter System chapter)



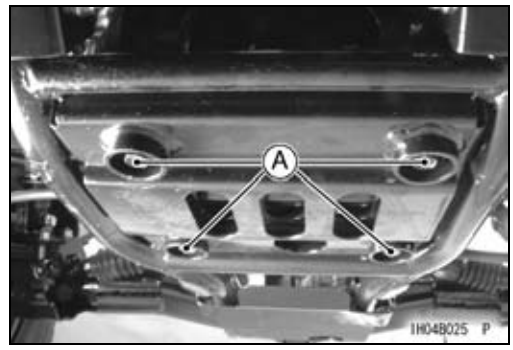
- Remove:
  Engine Mount Stay (see Transmission Case Removal in the Transmission chapter)
  Air Duct (see Fuel Pipe Removal in the Fuel System chapter)
  Dipstick (see Oil Level Inspection in the Engine Lubrication System chapter)
  Shift Shaft Lever of Shift Cable and Hi/Low Cable
  Water Hoses [A] (Upper and Lower)
  Injection Pump Cover [B] and Bracket
  Fuel Hoses [C]
  Throttle Cable End Rod [D]
- Disconnect:
  Coolant Temperature Switch Lead Connector [E]
  Glow Plug Lead [F]
  Fuel Cut Solenoid Lead Connector [G]
  Oil Pressure Switch Lead Connector [H]
  Alternator Cable and Alternator Lead Connector [I]



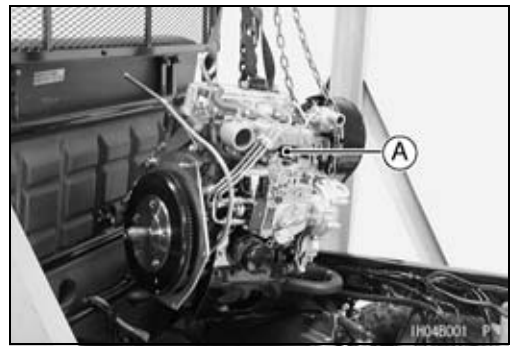
- Remove:
  Starter Motor Cable [A]
  Starter Motor Lead Connector [B]
  Engine Ground Cable [C]

Engine Removal/Installation

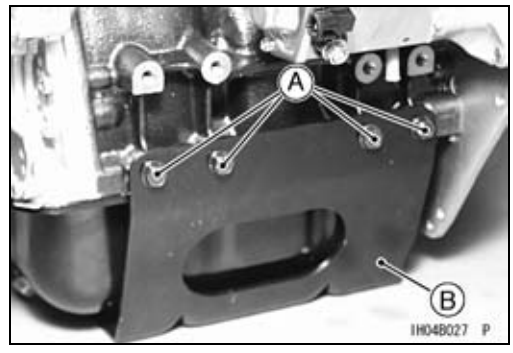
- Remove the engine mounting bolts [A] and washers.



- Remove the engine [A].

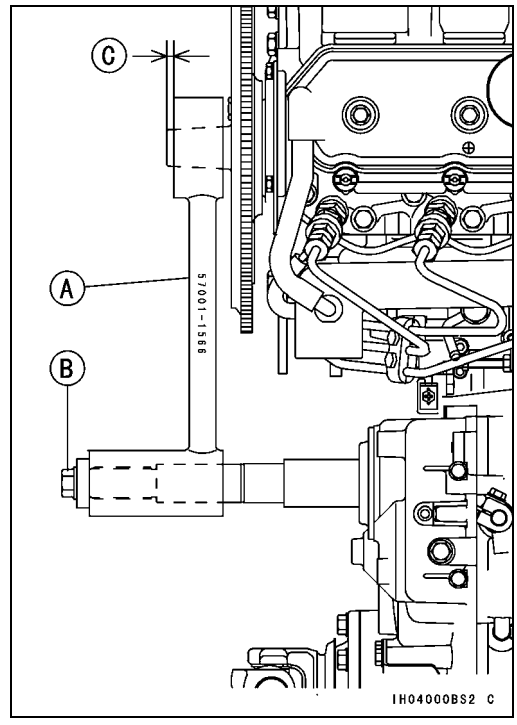


- Remove:
  Engine Bracket Bolts [A] (Both Sides)
  Engine Bracket [B]



Engine Removal/Installation

Engine Installation



- Install the engine on the bracket.
- Apply a non-permanent locking agent to the threads of the engine bracket bolts and tighten them.
- Adjust the engine mounting position for alignment of the torque converter.

○Mount the engine and install the engine mounting bolts loosely.

○Install the assembly jig [A] onto the transmission driven shaft and crankshaft as shown in the figure.

Special Tool - Assembly Jig: 57001-1566

○Screw in the bolt [B] until the assembly jig is fitted to the transmission driven shaft. The length [C] between the jig and the end of coupling is 5 mm (0.20 in.).

○Tighten:

Torque - Engine Mounting Bolts: 44 N·m (4.5 kgf·m, 32 ft·lb)

○Remove the assembly jig.

- Install the removed parts (see appropriate chapters).
- Tighten:

Torque - Stay Rod Rear Nut: 88 N·m (9.0 kgf·m, 65 ft·lb)

- Adjust:

  Engine Oil (see Engine Oil and/or Oil Filter Change in the Periodic Maintenance chapter)

  Coolant (see Coolant Change in the Periodic Maintenance chapter)

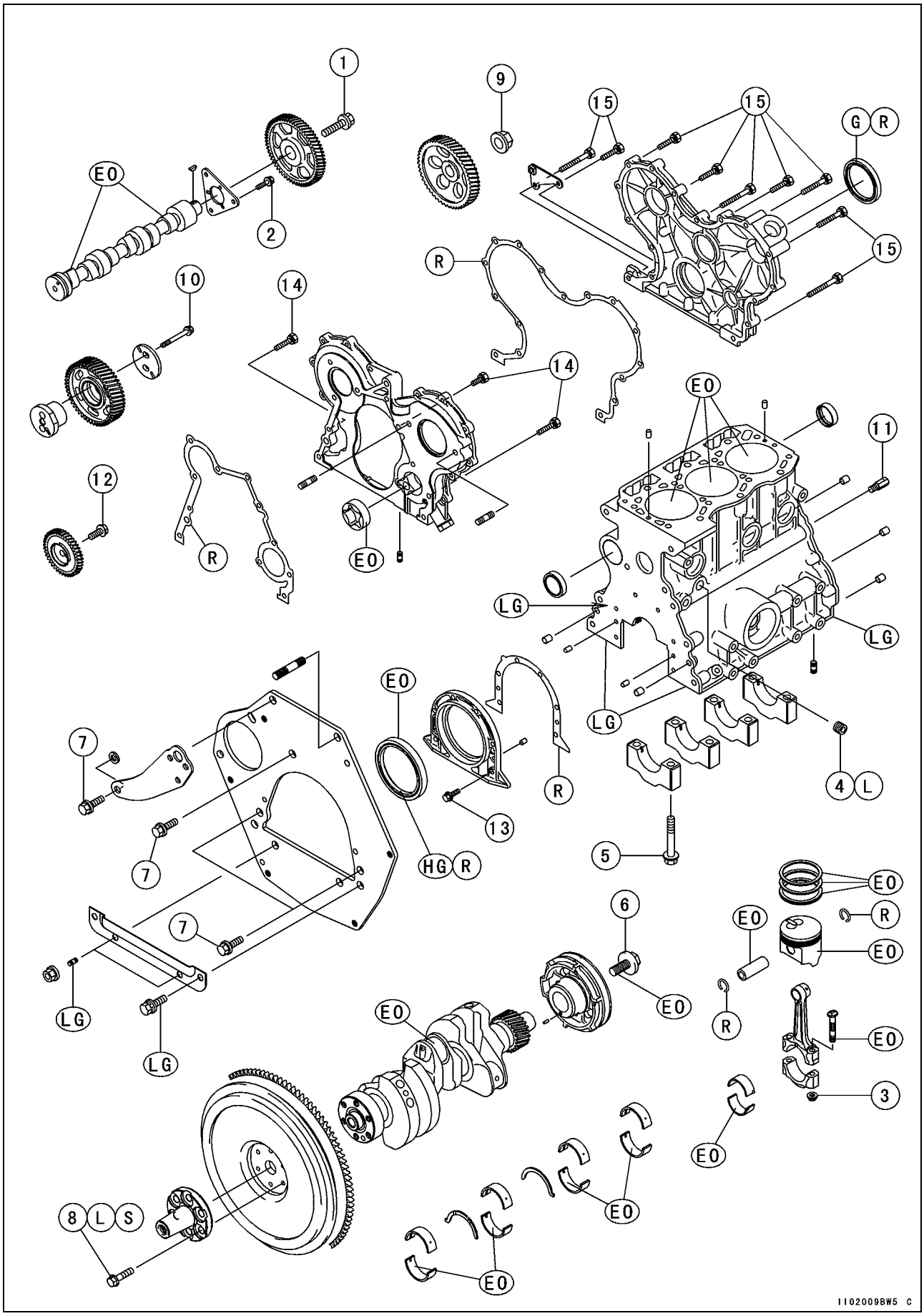
Crankshaft/Crankcase

Table of Contents

Exploded View 9-2
Specifications 9-4
Special Tools 9-6
Timing Gear Case 9-8
  Timing Gear Case Removal 9-8
  Timing Gear Case Installation 9-9
  Timing Gear Case Cover Oil Seal Replacement 9-12
  Timing Gear Inspection 9-13
Camshaft 9-15
  Camshaft Removal 9-15
  Camshaft Installation 9-16
  Camshaft Inspection 9-17
Crankshaft and Connecting Rods 9-18
  Connecting Rod Removal 9-18
  Connecting Rod Installation 9-18
  Crankshaft Removal 9-19
  Crankshaft Installation 9-19
  Connecting Rod Big End Side Clearance 9-20
  Connecting Rod Inspection 9-21
  Crankshaft Inspection 9-21
  Crankshaft Side Clearance 9-23
  Connecting Rod Big End Bearing Insert/Crankpin Wear 9-23
  Crankshaft Main Bearing Insert/Journal Wear 9-24
End Plate 9-25
  End Plate Removal 9-25
  End Plate Installation 9-25
Oil Seal Retainer 9-27
  Oil Seal Replacement 9-27
Pistons and Crankcase 9-28
  Piston Removal 9-28
  Piston Installation 9-28
  Crankcase Removal 9-29
  Crankcase Warp 9-29
  Crankcase Wear 9-30
  Piston Diameter 9-30
  Piston/Cylinder Clearance 9-31
  Cylinder Boring, Honing 9-31
  Camshaft Bearing Replacement 9-31
  Camshaft Plug Replacement 9-32
  Piston Ring and Ring Groove Wear 9-32
  Piston Ring End Gap 9-33
  Piston Ring Thickness 9-33
  Piston and Piston Pin Wear 9-33

9-2 CRANKSHAFT/CRANKCASE

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Camshaft Drive Gear Bolt	43	4.4	32	
2	Camshaft Retainer Bolts	7.8	0.80	69 in·lb	
3	Connecting Rod Cap Nuts	36	3.7	27	
4	Coolant Drain Plug	25	2.5	18	L
5	Crankshaft Main Bearing Cap Bolts	59	6.0	44	
6	Crankshaft Pulley Bolt	98	10.0	72.3	EO
7	End Plate Bolts	39	4.0	29	
8	Flywheel Mounting Bolts	44	4.5	32	L, S
9	Fuel Injection Pump Drive Gear Nut	64	6.5	47	
10	Idle Gear Bolts	25	2.5	18	
11	Oil Nozzle	14	1.4	10	
12	Oil Pump Drive Gear Bolt	20	2.0	15	
13	Oil Seal Retainer Bolts	5.4	0.55	48 in·lb	
14	Timing Gear Case Bolts	7.8	0.80	69 in·lb	
15	Timing Gear Case Cover Bolts	7.8	0.80	69 in·lb	

EO: Apply engine oil.
G: Apply grease.
HG: Apply high-temperature grease.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket.
R: Replacement Parts
S: Follow the specified tightening sequence.

Specifications

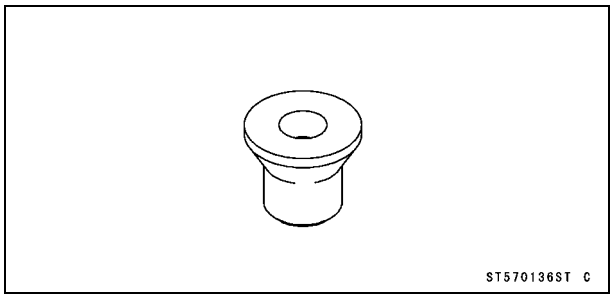
Item	Standard	Service Limit
Timing Gear Case		
Timing Gear Backlash	– – –	0.2 mm (0.008 in.)
Idle Gear Inside Diameter	– – –	34.17 mm (1.3453 in.)
Idle Gear Shaft Outside Diameter	– – –	33.91 mm (1.3350 in.)
Camshaft		
Cam Height:		
Inlet	30.065 ~ 30.135 mm (1.1837 ~ 1.1864 in.)	29.965 mm (1.1797 in.)
Exhaust	30.065 ~ 30.135 mm (1.1837 ~ 1.1864 in.)	29.965 mm (1.1797 in.)
Camshaft Journal Diameter:		
Right Side	35.959 ~ 35.975 mm (1.4157 ~ 1.4163 in.)	35.89 mm (1.413 in.)
Center	35.910 ~ 35.955 mm (1.4138 ~ 1.4155 in.)	35.84 mm (1.411 in.)
Left Side	35.910 ~ 35.955 mm (1.4138 ~ 1.4155 in.)	35.84 mm (1.411 in.)
Camshaft Runout	– – –	0.03 mm (0.0012 in.)
Crankshaft and Connecting Rods		
Connecting Rod Big End Side Clearance	0.15 ~ 0.28 mm (0.0059 ~ 0.0110 in.)	0.3 mm (0.0118 in.)
Connecting Rod Small End:		
Inside Diameter	– – –	18.03 mm (0.7098 in.)
Connecting Rod Big End:		
Out of Round	– – –	0.02 mm (0.0008 in.)
Connecting Rod Thrust Faces:		
Distortion	– – –	0.05 mm (0.0020 in.)
Crankshaft Main Journal Diameter	41.976 ~ 42.000 mm (1.6526 ~ 1.6535 in.)	– – –
Crankshaft Crankpin Diameter	36.976 ~ 37.000 mm (1.4557 ~ 1.4567 in.)	– – –
Crankshaft Out of Round and Taper	– – –	0.02 mm (0.0008 in.)
Undersize Crankshaft Main Bearing Inserts	0.25 mm (0.0098 in.) Undersize	– – –
Crankshaft #3 Main Journal Runout	– – –	0.06 mm (0.0024 in.)
Crankshaft Side Clearance	0.02 ~ 0.24 mm (0.0008 ~ 0.0094 in.)	0.30 mm (0.0118 in.)
Oversize Thrust Washers	0.12 mm (0.0047 in.) Oversize	– – –

Specifications

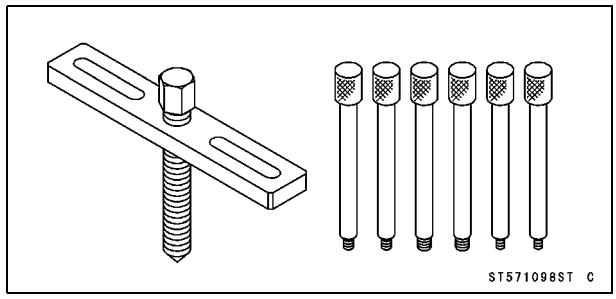
Item	Standard	Service Limit
Crankshaft #3 Main Journal Width	22.00 ~ 22.07 mm (0.8661 ~ 0.8689 in.)	– – –
Connecting Rod Big End Bearing Insert/Crankpin Clearance	0.020 ~ 0.044 mm (0.0008 ~ 0.0017 in.)	0.07 mm (0.0028 in.)
Crankshaft Main Bearing Insert/Journal Clearance	0.020 ~ 0.044 mm (0.0008 ~ 0.0017 in.)	0.07 mm (0.0028 in.)
Pistons and Crankcase		
Crankcase Warp	– – –	0.08 mm (0.0031 in.)
Crankcase Height	238.70 ~ 239.30 mm (9.3976 ~ 9.4212 in.)	238.60 mm (9.3937 in.)
Cylinder Inside Diameter	72.00 ~ 72.03 mm (2.8346 ~ 2.8358 in.)	72.105 mm (2.8388 in.) or more than 0.035 mm (0.0014 in.) difference between any two measurements
Valve Lifter Bore Inside Diameter	18.018 mm (0.7094 in.)	18.05 mm (0.7106 in.)
Camshaft Bearing Inside Diameter	– – –	36.06 mm (1.4197 in.)
Piston Diameter	71.93 ~ 71.96 mm (2.8319 ~ 2.8331 in.)	– – –
Piston/Cylinder Clearance	0.06 ~ 0.08 mm (0.0024 ~ 0.0031 in.)	0.12 mm (0.0047 in.)
Oversize Piston and Rings	0.25 mm (0.0098 in.) Oversize	– – –
Piston Ring/Groove Clearance (Top, Second and Oil Ring)	– – –	less than 0.12 mm (0.0047 in.)
Piston Ring End Gap (Top, Second and Oil Ring)	– – –	0.70 mm (0.0276 in.)
Piston Ring Thickness:		
Top	1.445 ~ 1.465 mm (0.0569 ~ 0.0577 in.)	– – –
Second	1.470 ~ 1.490 mm (0.0579 ~ 0.0587 in.)	– – –
Oil	2.970 ~ 2.990 mm (0.1169 ~ 0.1177 in.)	– – –
Piston Pin Bore Diameter	– – –	18.03 mm (0.7098 in.)
Piston Pin Diameter	– – –	17.98 mm (0.7079 in.)

Special Tools

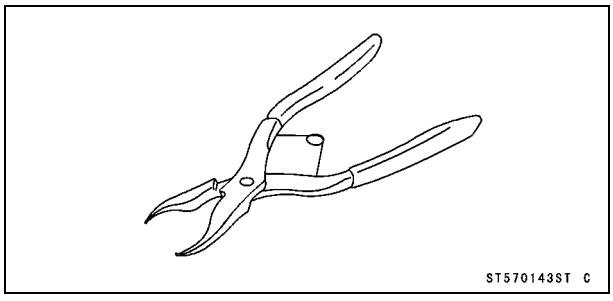
Bearing Puller Adapter:
57001-136



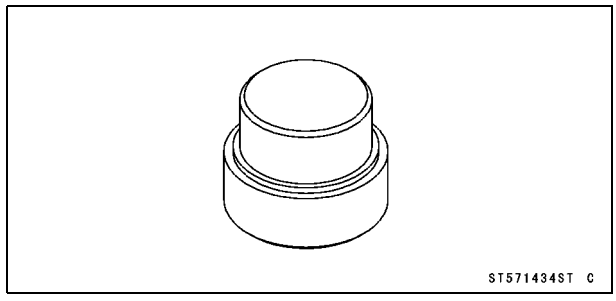
Crankcase Splitting Tool Assembly:
57001-1098



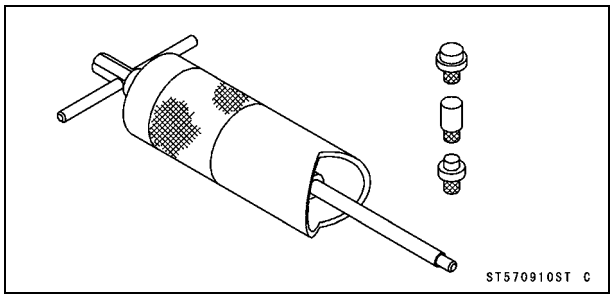
Inside Circlip Pliers:
57001-143



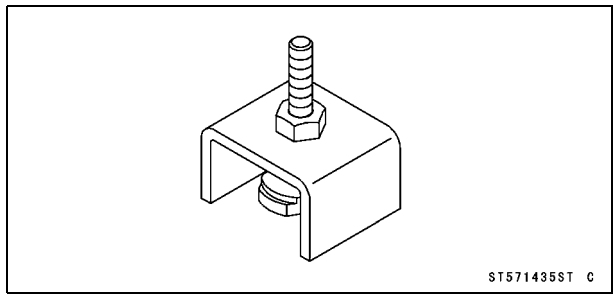
Camshaft Bearing Driver:
57001-1434



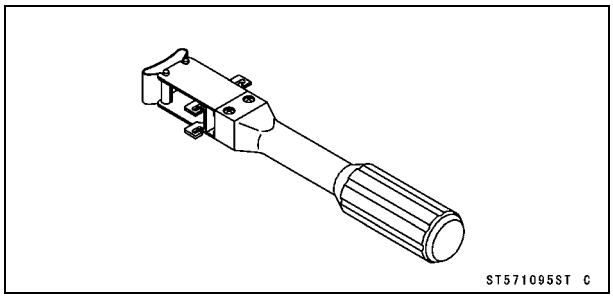
Piston Pin Puller Assembly:
57001-910



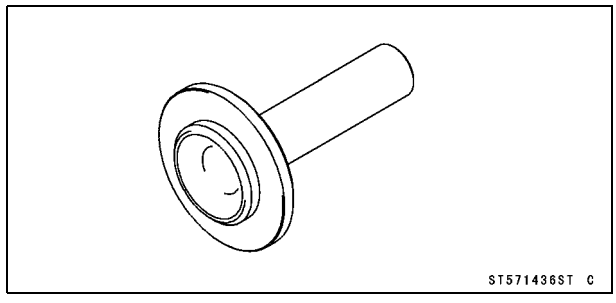
Camshaft Bearing Remover:
57001-1435



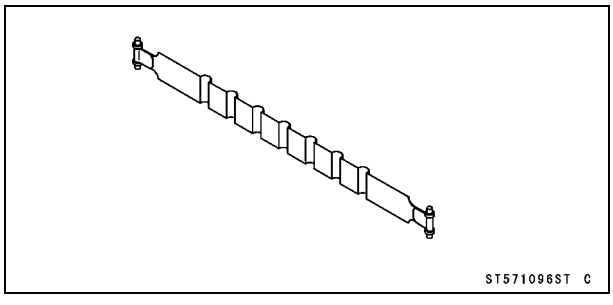
Piston Ring Compressor Grip:
57001-1095



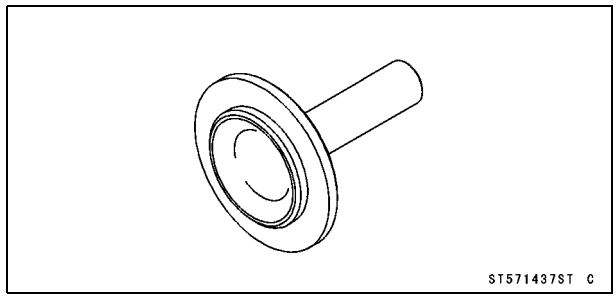
Timing Gear Cover Oil Seal Driver:
57001-1436



Piston Ring Compressor Belt, ϕ50 ~ ϕ67:
57001-1096

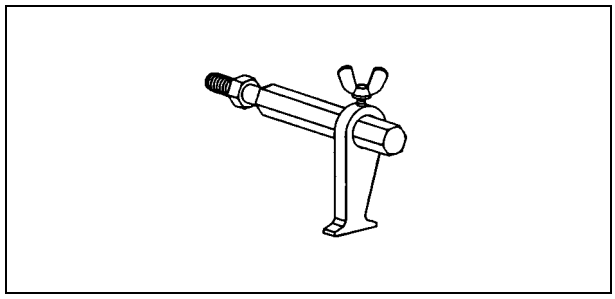


Retainer Oil Seal Driver:
57001-1437



Special Tools

Flywheel Holder:
57001-1438

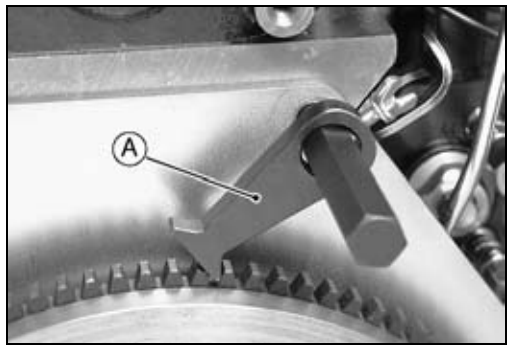


Timing Gear Case

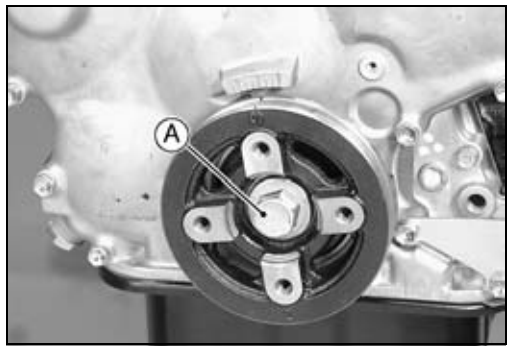
Timing Gear Case Removal

- Remove:
  Engine (see Engine Removal in the Engine Removal/Installation chapter)
  Fan Belt (see Alternator Removal in the Electrical System chapter)
- Using the flywheel holder [A], hold the crankshaft.

Special Tool - Flywheel Holder: 57001-1438

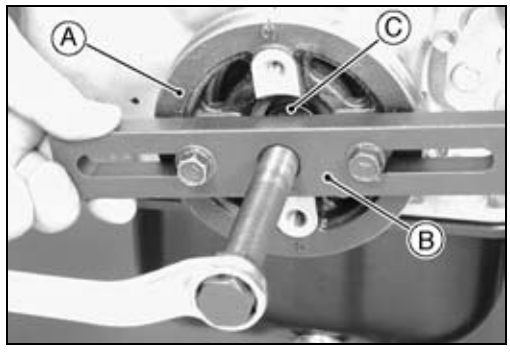


- Remove the crankshaft pulley bolt [A].

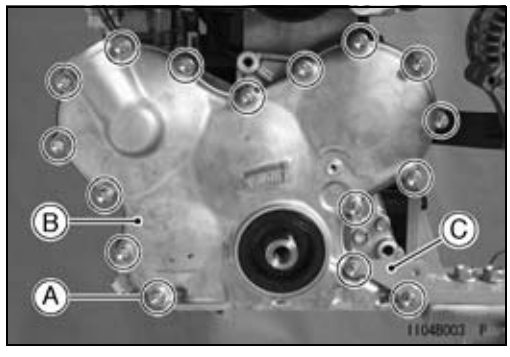


- Remove the crankshaft pulley [A].

Special Tools - Bearing Puller Adapter [C]: 57001-136
Crankcase Splitting Tool Assembly [B]: 57001-1098



- Remove:
  Oil Pan and Oil Strainer (see Oil Pan and Oil Strainer Removal in the Engine Lubrication System chapter)
  Timing Gear Case Cover Bolts [A]
  Timing Gear Case Cover [B]
  Bracket [C]



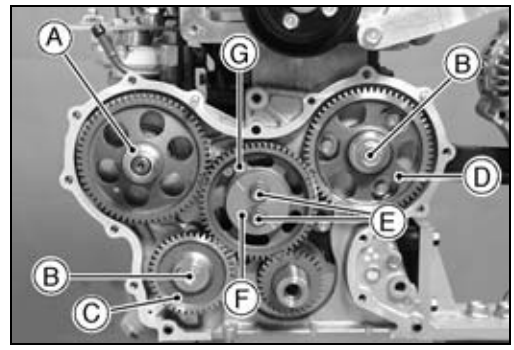
- Temporary, install the flywheel for the crankshaft holding.
○Using the flywheel holder [A], hold the crankshaft.

Special Tool - Flywheel Holder: 57001-1438

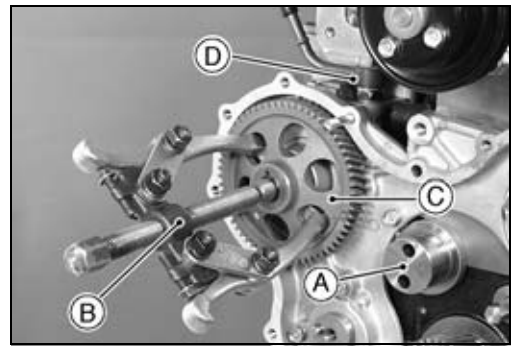


Timing Gear Case

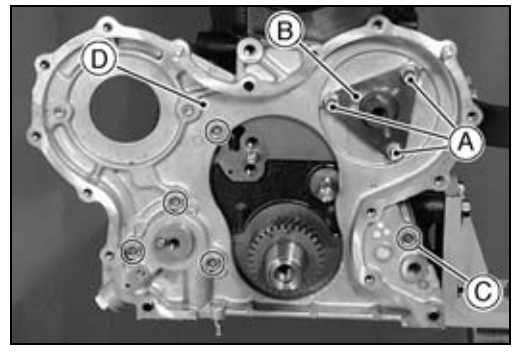
- Remove:
  Gear Nut [A]
  Gear Bolts [B]
  Oil Pump Drive Gear [C]
  Camshaft Drive Gear [D]
- Position the flywheel holder to the opposite side.
- Remove:
  Idle Gear Bolts [E]
  Thrust Plate [F]
  Idle Gear [G]



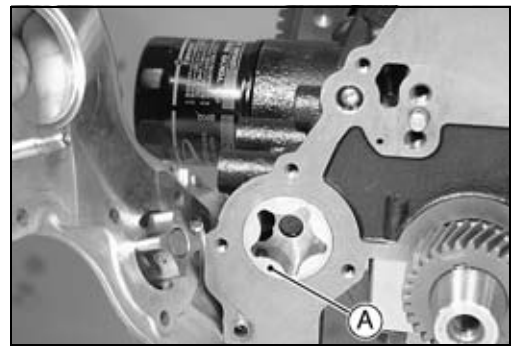
- Remove the idle gear shaft [A].
- Using a suitable bearing puller [B], remove the fuel injection pump drive gear [C].
- Remove the fuel injection pump [D] (see Fuel Injection Pump Removal in the Fuel System chapter).



- Remove:
  Camshaft Retainer Bolts [A]
  Camshaft Retainer [B]
  Timing Gear Case Bolts [C]
  Timing Gear Case [D]

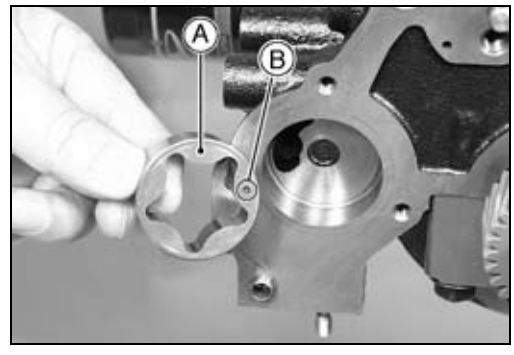


- Remove the oil pump outer rotor [A].



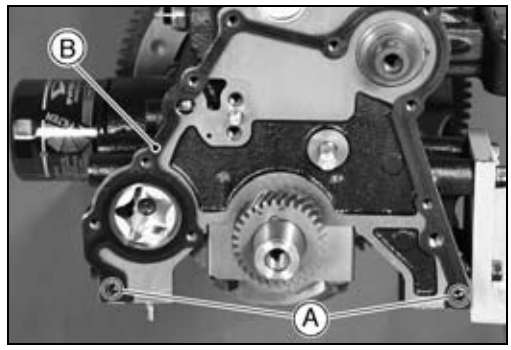
Timing Gear Case Installation

- Clean and lubricate the oil pump outer rotor [A] with engine oil.
- Install the oil pump outer rotor with the punch mark [B] facing inside.



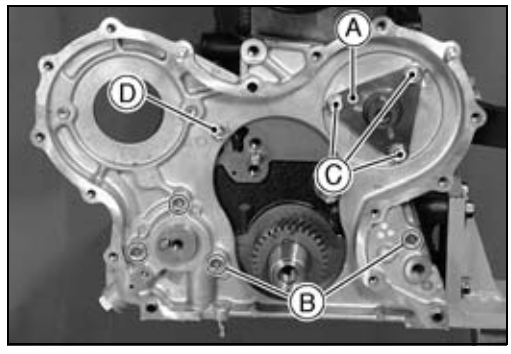
Timing Gear Case

● Install:
Dowel Pins [A]
New Timing Gear Case Gasket [B]
Timing Gear Case
○Rotate the oil pump shaft to engage oil pump rotors.

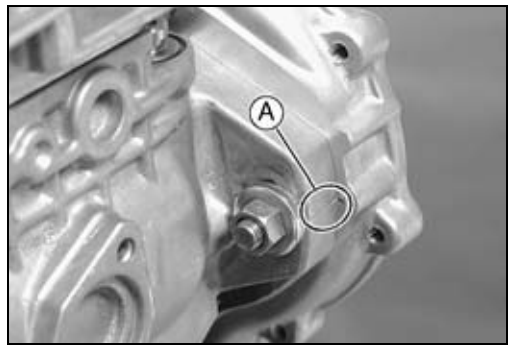


● Install the camshaft retainer [A].
● Tighten:

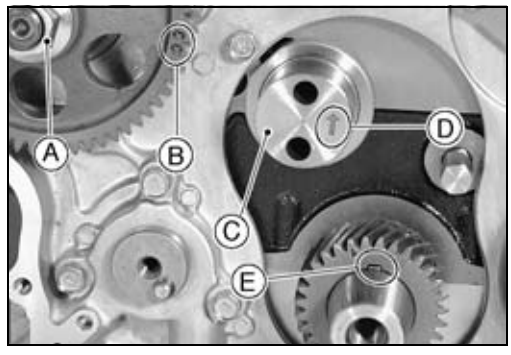
Torque - Camshaft Retainer Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)
Timing Gear Case Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)
28 mm (1.10 in.) [B]
18 mm (0.71 in.) [C]
16 mm (0.63 in.) [D]



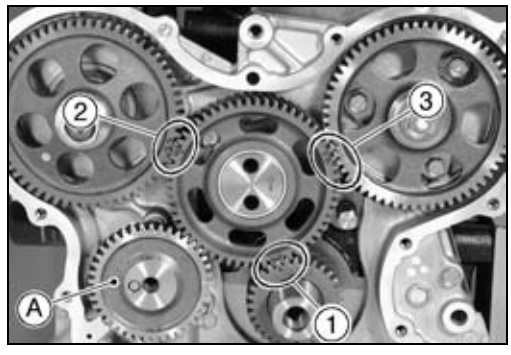
● Install the fuel injection pump temporarily.
● Align the marks [A] on the injection pump and the timing gear case.



● Install:
Fuel Injection Pump Drive Gear and Nut [A]
Camshaft Drive Gear and Bolt
○Face the timing marks [B] on the gears upward.
● Install the idle gear shaft [C] with the arrow [D] facing the engine top.
● Position the crankshaft key [E] upward (top position).



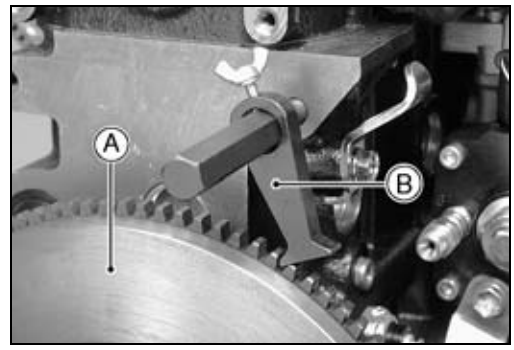
● Install the idle gear so that the timing marks on the gears are positioned as shown in the figure.
[1] Idle Gear (AA) — (A) Crankshaft Gear
[2] Idle Gear (C) — (CC) or (C) Fuel Injection Pump Drive Gear
[3] Idle Gear (BB) — (B) Camshaft Drive Gear
● Install the oil pump drive gear [A] and bolt.



Timing Gear Case

● Temporarily install the flywheel [A] to hold the crankshaft.
○Using the flywheel holder [B] angled toward the rear of the engine, hold the crankshaft.

Special Tool - Flywheel Holder: 57001-1438

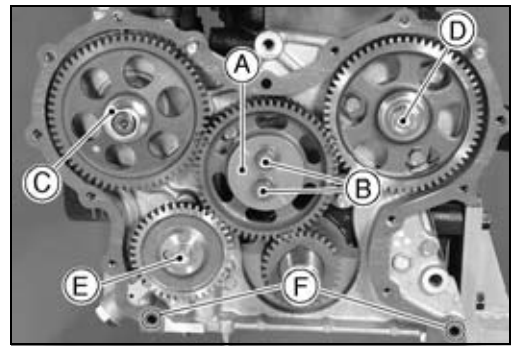


● Install the thrust plate [A].
● Tighten:

Torque - Idle Gear Bolts [B]: 25 N·m (2.5 kgf·m, 18 ft·lb)

● Position the flywheel holder to the forward side of the engine.
● Tighten:

Torque - Fuel Injection Pump Drive Gear Nut [C]: 64 N·m (6.5 kgf·m, 47 ft·lb)
Camshaft Drive Gear Bolt [D]: 43 N·m (4.4 kgf·m, 32 ft·lb)
Oil Pump Drive Gear Bolt [E]: 20 N·m (2.0 kgf·m, 15 ft·lb)



● Install:
New Timing Gear Case Cover Gasket
Dowel Pins [F]

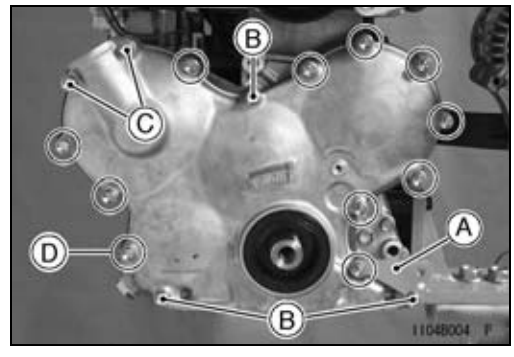
● Confirm the small hole in the oil nozzle [A] faces the engagement of the idle gear and camshaft drive gear.
● Tighten:

Torque - Oil Nozzle: 14 N·m (1.4 kgf·m, 10 ft·lb)



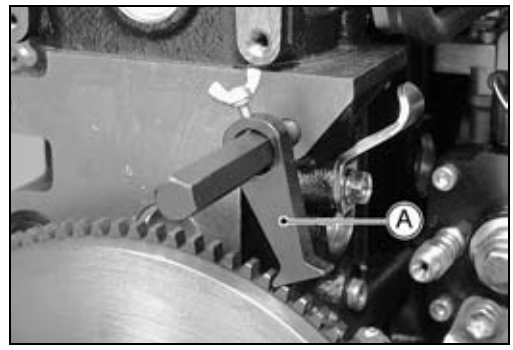
● Install:
Timing Gear Case Cover
Bracket [A]
● Tighten:

Torque - Timing Gear Case Cover Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)
55 mm (2.17 in.) [B]
45 mm (1.77 in.) [C]
30 mm (1.18 in.) [D]



Timing Gear Case

- Position the flywheel holder [A] back to the rear side of the engine as shown in the figure.

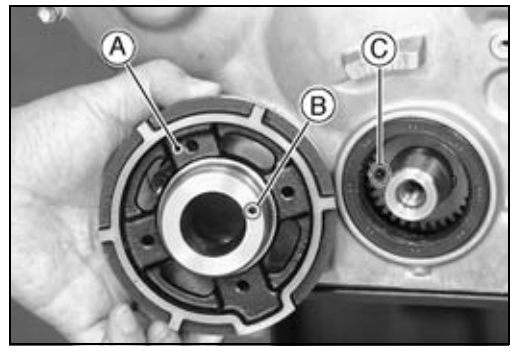


- Wipe off the excessive oil stuck on the tapered areas of the pulley and its engaging area with a ragged cloth before installation.
- Install the crankshaft pulley [A] and bolt.

○Fit the hole [B] in the crankshaft pulley on the pin [C] in the crankshaft gear.

- Apply thin coat of engine oil to the threads of tightening bolt. Do not apply excessive oil to its threads.
- Tighten:

Torque - Crankshaft Pulley Bolt: 98 N·m (10.0 kgf·m, 72.3 ft·lb)

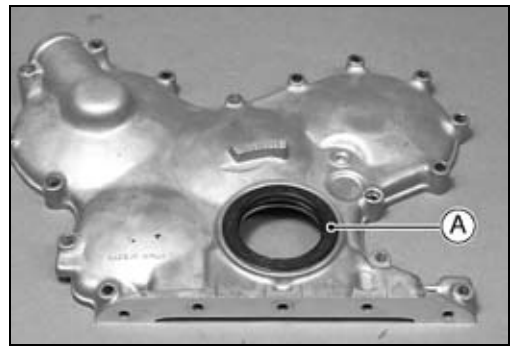


- Install the removed parts (see appropriate chapters).
- Adjust the fuel injection pump timing (see Fuel Injection Pump Timing Inspection in the Fuel System chapter)

Timing Gear Case Cover Oil Seal Replacement

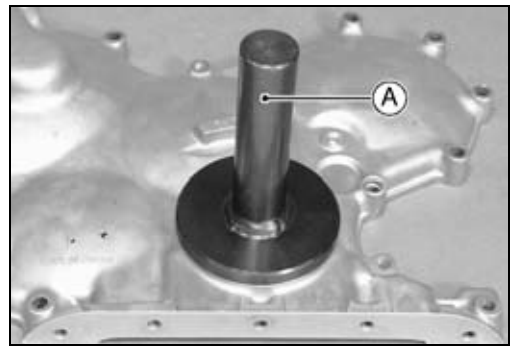
- Remove:

Timing Gear Case Cover (see Timing Gear Case Removal)
Oil Seal [A]



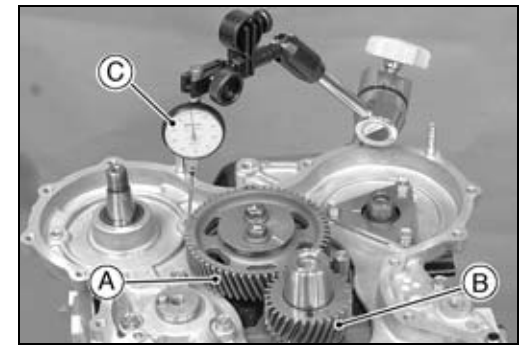
- Press in the oil seal with the manufacturer's marks facing out.

Special Tool - Timing Gear Cover Oil Seal Driver [A]: 57001 -1436



Timing Gear Case

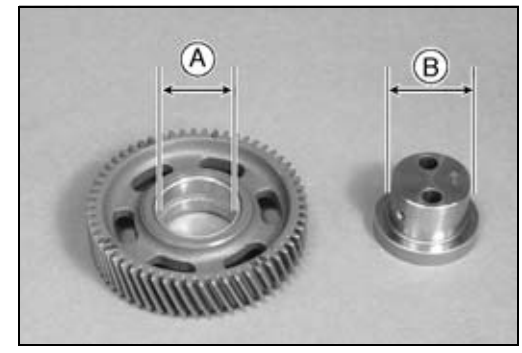
Timing Gear Inspection



- Inspect the timing gears using the following sequence.
- Check the timing gear backlash between the idle gear [A] and crankshaft gear [B].
- Remove:
  Camshaft Drive Gear (see Timing Gear Case Removal)
  Fuel Injection Pump Drive Gear (see Timing Gear Case Removal)
  Oil Pump Drive Gear (see Timing Gear Case Removal)

○Set the tip of the dial gauge [C] on the idle gear tooth.
○Hold the crankshaft.
○Move the idle gear back and forth noting indicator reading.

Timing Gear Backlash
Service Limit: 0.2 mm (0.008 in.)

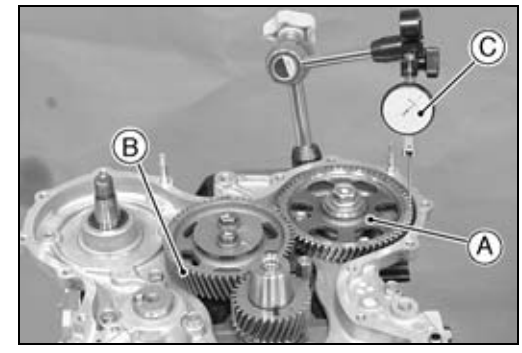


★If the backlash exceeds the service limit, check the idle gear bearing and shaft for wear.

Idle Gear Inside Diameter [A]
Service Limit: 34.17 mm (1.3453 in.)

Idle Gear Shaft Outside Diameter [B]
Service Limit: 33.91 mm (1.3350 in.)

★If the idle gear bearing and shaft are within the service limit, replace the idle gear and recheck the backlash.
★If the backlash exceeds the service limit with a new idle gear, crankshaft gear is worn.
★If the crankshaft gear is worn, replace the crankshaft.

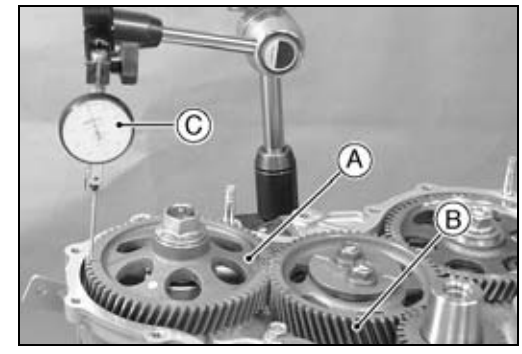


- Check the timing gear backlash between the camshaft drive gear [A] and idle gear [B].

○Set the tip of the dial gauge [C] on the camshaft drive gear tooth.
○Hold the idle gear.
○Move the camshaft drive gear back and forth noting indicator reading.

Timing Gear Backlash
Service Limit: 0.2 mm (0.008 in.)

★If the backlash exceeds the service limit, replace the camshaft drive gear.



- Check the timing gear backlash between the fuel injection pump drive gear [A] and idle gear [B].

○Set the tip of the dial gauge [C] on the fuel injection pump drive gear tooth.
○Hold the idle gear.
○Move the fuel injection pump drive gear back and forth noting indicator reading.

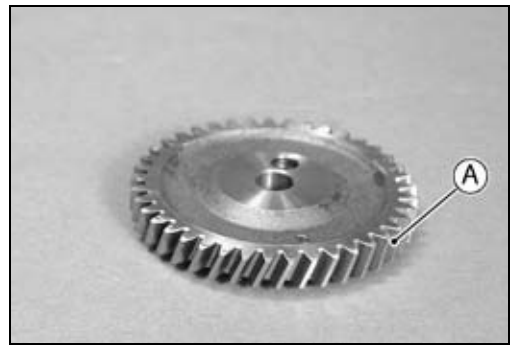
Timing Gear Backlash
Service Limit: 0.2 mm (0.008 in.)

★If the backlash exceeds the service limit, replace the fuel injection pump drive gear.

Timing Gear Case

- Visually inspect the oil pump drive gear teeth [A] for wear and damage.

★If the teeth are damaged or worn, replace the oil pump drive gear.

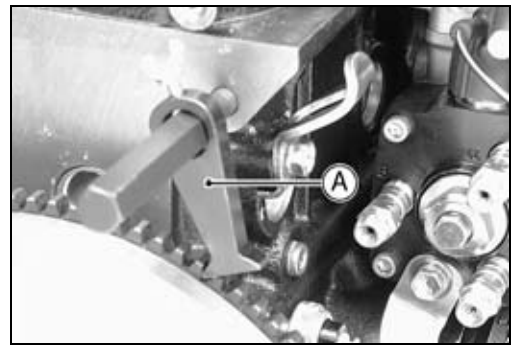


Camshaft

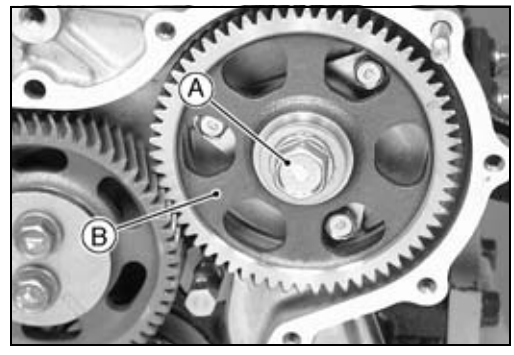
Camshaft Removal

- Remove:
  Engine (see Engine Removal in the Engine Removal/Installation chapter)
  Cylinder Head (see Cylinder Head Removal in the Engine Top End chapter)
  Valve Lifters (see Valve Lifter Removal in the Engine Top End chapter)
  Oil Pan (see Oil Pan and Oil Strainer Removal in the Engine Lubrication System chapter)
  Timing Gear Case Cover (see Timing Gear Case Removal)
- Temporarily, install the flywheel to hold the crankshaft.
- Using the flywheel holder [A] angled toward the rear of the engine, hold the crankshaft.

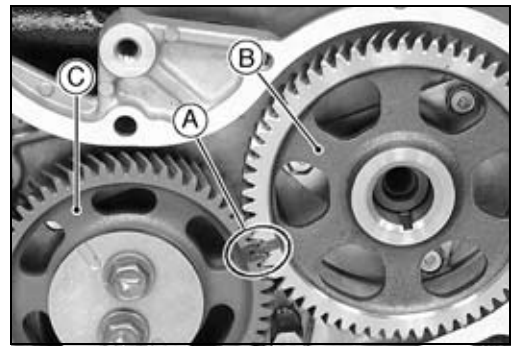
  Special Tool - Flywheel Holder: 57001-1438



- Remove:
  Camshaft Drive Gear Bolt [A]
  Camshaft Drive Gear [B]

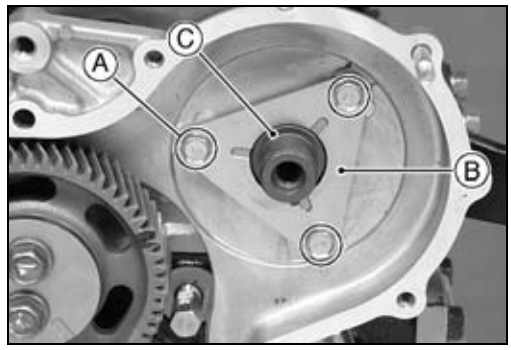


○Mark the positions [A] of the camshaft drive gear [B] and idle gear [C] so that the camshaft drive gear can be installed later in the same position.
○Do not turn the idle gear while the camshaft drive gear is removed.



Camshaft

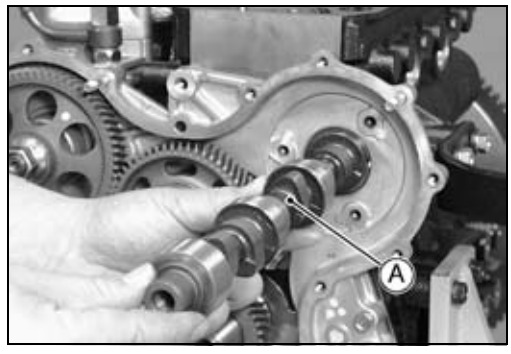
● Remove:
Camshaft Retainer Bolts [A]
Camshaft Retainer [B]
Camshaft [C]
○Use care when removing the camshaft to prevent damaging the cam bearings, journals and lobes.



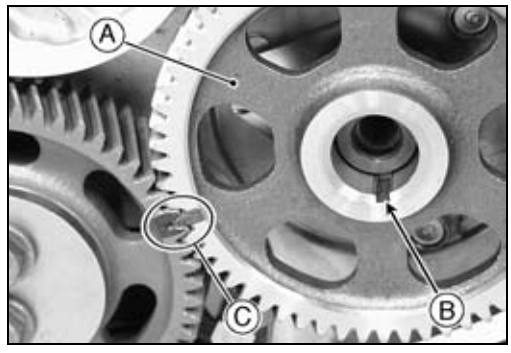
Camshaft Installation

● Apply engine oil to all cam parts and journals.
● Install the camshaft [A].
○Take care when installing the camshaft to prevent damaging the cam bearings, journals and lobes.
● Install:
Camshaft Retainer
Camshaft Retainer Bolts

Torque - Camshaft Retainer Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)

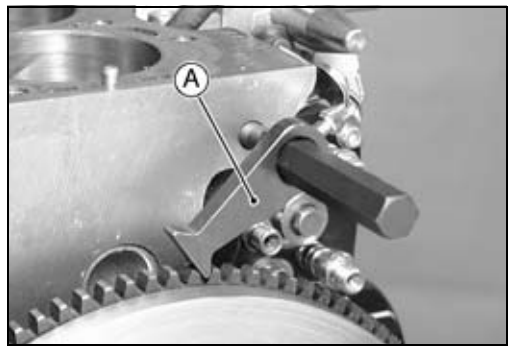


● Install the camshaft drive gear [A].
○Fit the groove [B] in the camshaft drive gear onto the key on the camshaft.
○Align the marks [C] on the camshaft drive gear and idle gear marked when removing.
○If the idle gear is turned, set the timing gears to the original positions (see Timing Gear Case Installation).



● Move the flywheel holder [A] to the forward side of the engine to hold the crankshaft.

Special Tool - Flywheel Holder: 57001-1438



● Tighten:

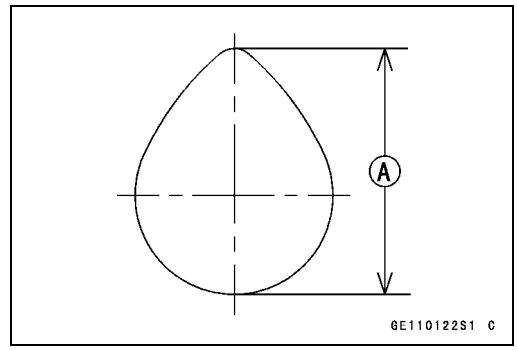
Torque - Camshaft Drive Gear Bolt [A]: 43 N·m (4.4 kgf·m, 32 ft·lb)

● Install the removed parts (see appropriate chapters).



Camshaft

Camshaft Inspection



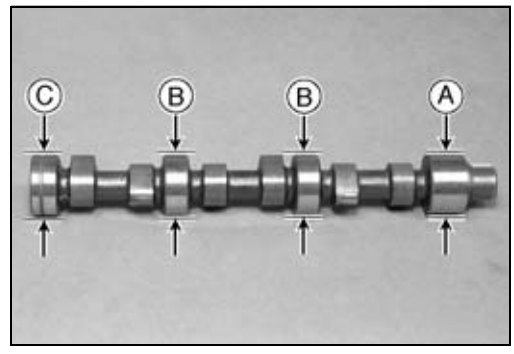
● Measure the overall height [A] of each cam.
★If any cam has worn past the service limit, replace the camshaft.

Cam Height
Standard:

Inlet	**30.065 ~ 30.135 mm (1.1837 ~ 1.1864 in.)**
Exhaust	**30.065 ~ 30.135 mm (1.1837 ~ 1.1864 in.)**

Service Limit:

Inlet	**29.965 mm (1.1797 in.)**
Exhaust	**29.965 mm (1.1797 in.)**



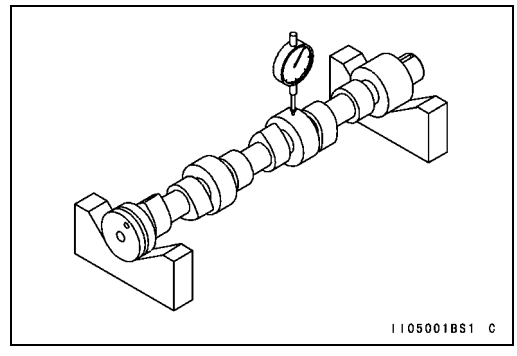
● Measure the diameter of the camshaft journals.
★If any journals has worn past the service limit, replace the camshaft.

Camshaft Journal Diameter
Standard:

Right Side [A]	**35.959 ~ 35.975 mm (1.4157 ~ 1.4163 in.)**
Center [B]	**35.910 ~ 35.955 mm (1.4138 ~ 1.4155 in.)**
Left Side [C]	**35.910 ~ 35.955 mm (1.4138 ~ 1.4155 in.)**

Service Limit:

Right Side [A]	**35.89 mm (1.413 in.)**
Center [B]	**35.84 mm (1.411 in.)**
Left Side [C]	**35.84 mm (1.411 in.)**



● Measure the camshaft runout.
★If the measurement exceeds the service limit, replace the camshaft.

Camshaft Runout
Service Limit: **0.03 mm (0.0012 in.)**

Crankshaft and Connecting Rods

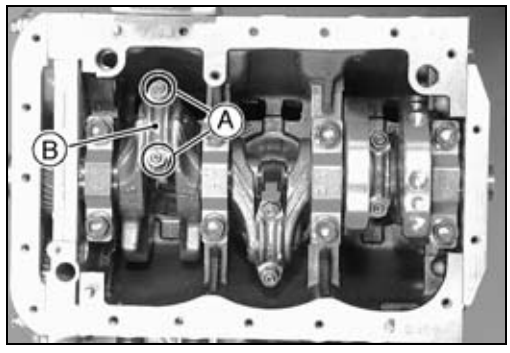
Connecting Rod Removal

- Remove:
  Engine (see Engine Removal in the Engine Removal/Installation chapter)
  Cylinder Head (see Cylinder Head Removal in the Engine Top End chapter)
  Valve Lifters (see Valve Lifter Removal in the Engine Top End chapter)
  Oil Pan (see Oil Pan and Oil Strainer Removal in the Engine Lubrication System chapter)
- Remove the carbon to prevent damaging the piston rings or piston.

NOTE

○*Number the connecting rod/piston assemblies before removing.*

- Remove:
  Connecting Rod Cap Nuts [A]
  Connecting Rod Cap [B]



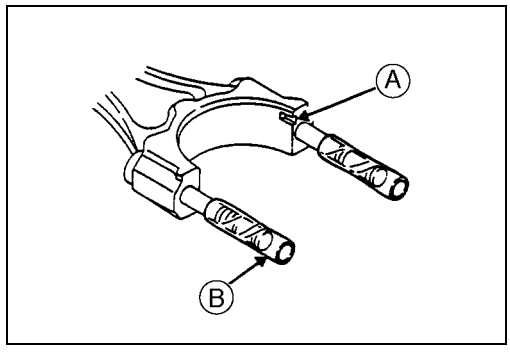
- Push the connecting rod end into the cylinder, and pull the piston and connecting rod out of the cylinder.
- Reassemble the connecting rod cap to the connecting rod to prevent interchanging components.

Connecting Rod Installation

- Install the connecting rod bearing inserts.

○Be sure tang [A] on the bearing inserts are seated in the notches in the connecting rod and cap.

- Install a piece of vinyl tubing [B] over each connecting rod threads to prevent damage to the threads or crankpin when installing the connecting rod.

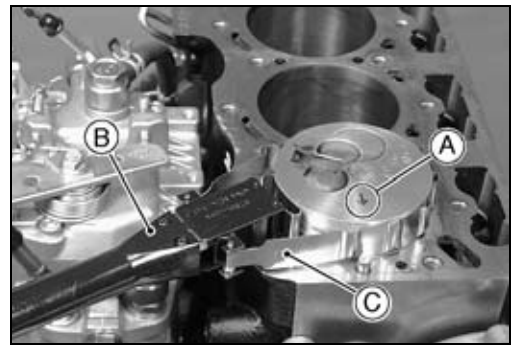


- Apply engine oil to the following parts.
  Cylinder Bores
  Pistons and Piston Rings
  Bearing Inserts and Crankpins
- Rotate the crankshaft so that the crankpin is at bottom of the stroke.

Crankshaft and Connecting Rods

● Insert the piston and connecting rod with the arrow [A] on the piston facing right side (timing gears side).
○Using the piston ring compressor grip [B] and the belt [C], lightly tap the top of the piston with a plastic mallet to insert the piston and connecting rod into the cylinder.

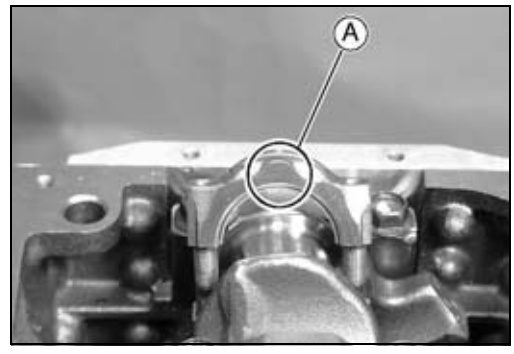
Special Tools - Piston Ring Compressor Grip: 57001-1095
Piston Ring Compressor Belt, ϕ50 ~ ϕ67: 57001-1096



● Apply engine oil to the threads of the connecting rod bolt.
● Install the connecting rod caps with ID mark [A] facing right side (timing gears side).
● Tighten:

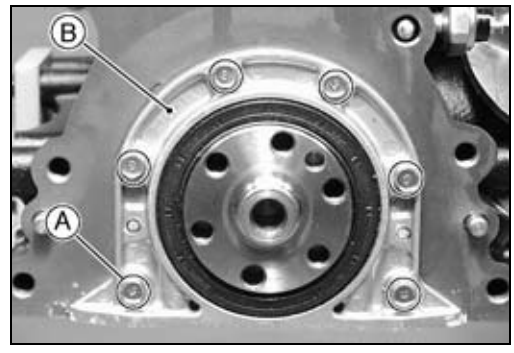
Torque - Connecting Rod Cap Nuts: 36 N·m (3.7 kgf·m, 27 ft·lb)

○After tightening the cap nuts, make sure the crankshaft rotates freely.

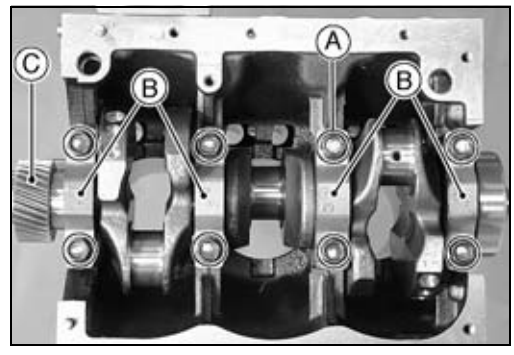


Crankshaft Removal

● Remove:
Camshaft (see Camshaft Removal)
Timing Gear Case (see Timing Gear Case Removal)
Connecting Rods (see Connecting Rod Removal)
Oil Seal Retainer Bolts [A]
Oil Seal Retainer [B] and Gasket



● Remove:
Crankshaft Main Bearing Cap Bolts [A]
Crankshaft Main Bearing Caps [B]
Crankshaft [C]
Thrust Washers (#3 Main Bearing)
● Remove the upper main bearing inserts from saddles and place with the respective bearing caps.

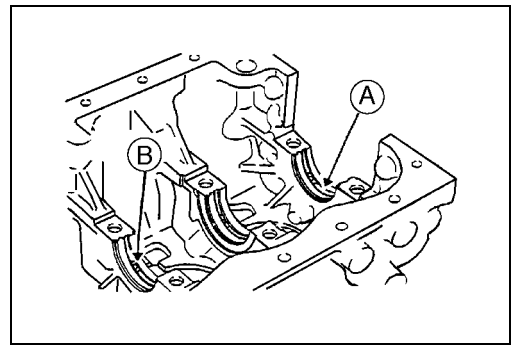


Crankshaft Installation

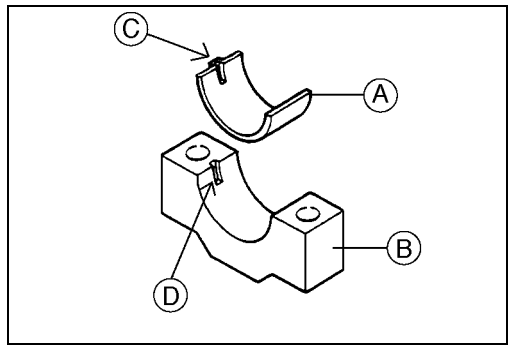
● Install the upper main bearing inserts in the crankcase.

NOTE

○*Upper main bearing inserts have an oil groove [A] and oil hole [B].*
○*Be sure the bearing inserts are seated in the saddles, and the tangs in the bearing inserts are aligned with the notches in the saddles.*



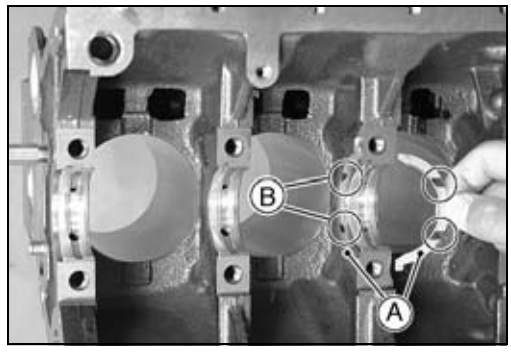
Crankshaft and Connecting Rods



- Install the lower main bearing inserts [A] in the bearing caps [B].

○Be sure the bearing inserts are seated in the bearing caps, and the tangs [C] in the bearing inserts are aligned with the notches [D] in the bearing caps.

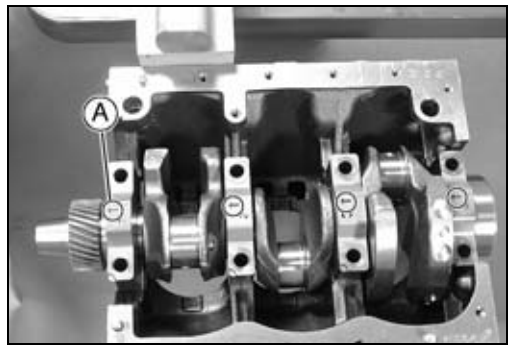
- Apply engine oil to the main bearing inserts.



- Install the thrust washers [A] at #3 main bearing with grooves [B] facing out.
- Install the crankshaft with the gear facing the right side (timing gears side).

○Take care not to damage the journals or bearing inserts.

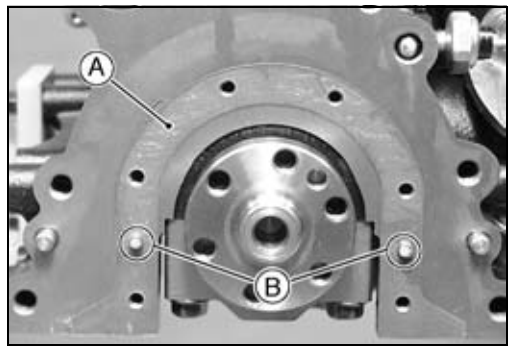
- Apply engine oil to the crankshaft main journals.



- Install the main bearing caps in their respective positions with the arrows [A] facing the right side (timing gear side).
- Tighten the cap bolts following the tightening sequence [1 ~ 4].

Torque - Crankshaft Main Bearing Cap Bolts: 59 N·m (6.0 kgf·m, 44 ft·lb)

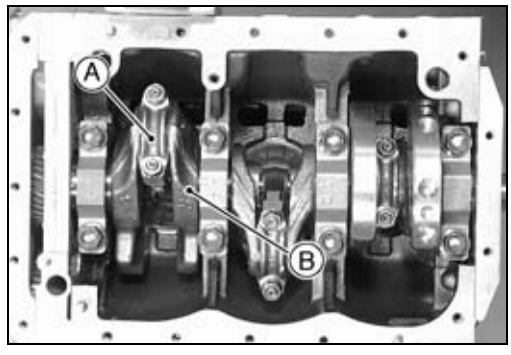
○After tightening the cap bolts, make sure the crankshaft rotates freely.



- Install:
  New Oil Seal Retainer Gasket [A]
  Dowel Pins [B]
  Oil Seal Retainer
- Tighten:

Torque - Oil Seal Retainer Bolts: 5.4 N·m (0.55 kgf·m, 48 in·lb)

Connecting Rod Big End Side Clearance



- Measure connecting rod big end side clearance.

○Insert a thickness gauge between the connecting rod big end [A] and either crank web [B] to determine clearance.

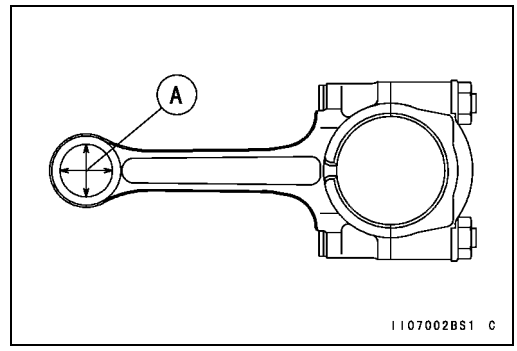
★If the clearance exceeds the service limit, replace the connecting rod with a new one and then check clearance again. If the clearance is too large after connecting rod replacement, the crankshaft also must be replaced.

Connecting Rod Big End Side Clearance

Standard:	**0.15 ~ 0.28 mm (0.0059 ~ 0.0110 in.)**
Service Limit:	**0.3 mm (0.0118 in.)**

Crankshaft and Connecting Rods

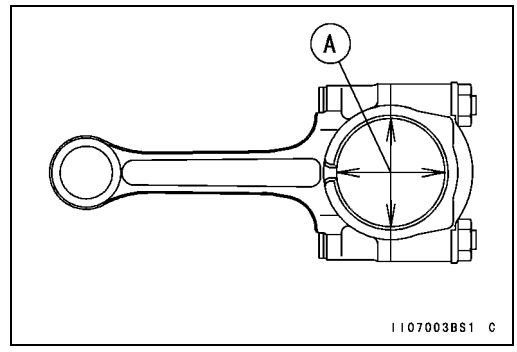
Connecting Rod Inspection



- Measure the inside diameter [A] of the connecting rod small end.

★If the connecting rod small end bore has worn past the service limit, replace the connecting rod.

Connecting Rod Small End
Service Limit
Inside Diameter: 18.03 mm (0.7098 in.)



- Measure the inside diameter [A] of the connecting rod big end.

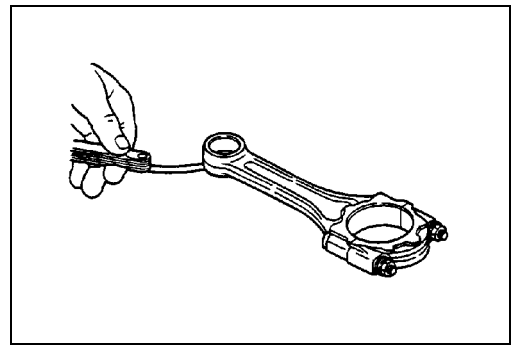
○With bearings removed, install the connecting rod cap.

- Tighten:

Torque - Connecting Rod Cap Nuts: 36 N·m (3.7 kgf·m, 27 ft·lb)

★If the connecting rod big end out of round exceeds the service limit, replace the connecting rod.

Connecting Rod Big End
Service Limit
Out of Round: 0.02 mm (0.0008 in.)



- Check for a bent or twisted connecting rod.

NOTE

○*The thrust faces must be free of any burrs or nicks, or the connecting rod will not lay flat on a surface plate.*

○Put the connecting rod on a surface plate. Any distortion will be evident by a rocking motion.

★If a 0.05 mm (0.0020 in.) thickness gauge can be inserted at the connecting rod small end, replace the connecting rod.

Connecting Rod Thrust Faces
Service Limit
Distortion: 0.05 mm (0.0020 in.)

Crankshaft Inspection

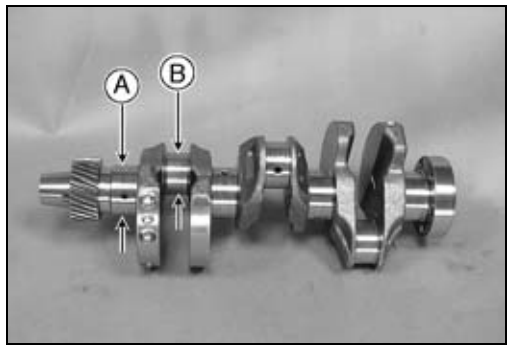


- Visually inspect the crankshaft main journals and crankpins for grooves or signs of scoring.

★If any damage is found, the crankshaft must be re-ground or replaced.

Crankshaft and Connecting Rods

● Check the crankshaft main journals and crankpins for wear and taper.



Crankshaft Main Journal Diameter [A]
Standard: 41.976 ~ 42.000 mm (1.6526 ~ 1.6535 in.)

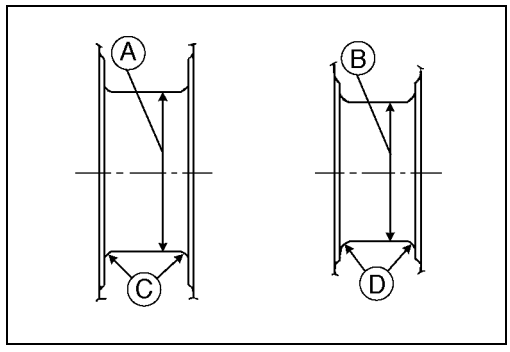
Crankshaft Crankpin Diameter [B]
Standard: 36.976 ~ 37.000 mm (1.4557 ~ 1.4567 in.)

Crankshaft Out of Round and Taper
Service Limit: 0.02 mm (0.0008 in.)

★If the crankshaft main journals are not within specification, the crankshaft may be re-ground and undersize bearing inserts installed.

Undersize Crankshaft Main Bearing Inserts
0.25 mm (0.0098 in.) Undersize

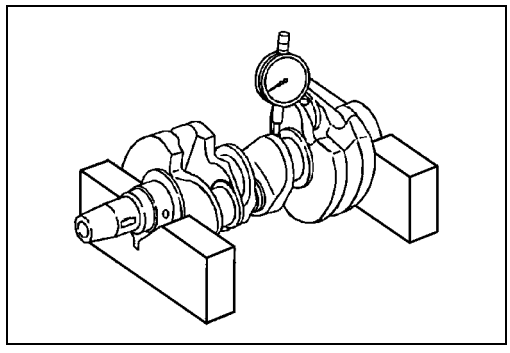
● The final finishing dimensions should be as shown in the table.



Finishing Dimensional Specifications

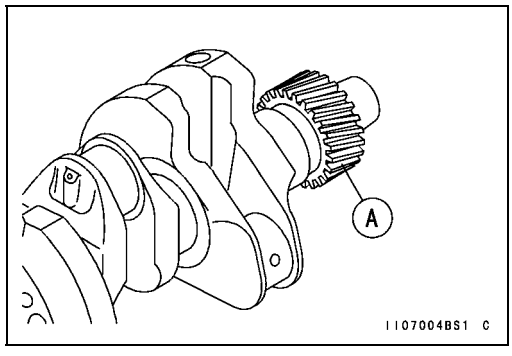
[A]	41.726 ~ 41.750 mm (1.6428 ~ 1.6437 in.)
[B]	36.726 ~ 36.750 mm (1.4459 ~ 1.4468 in.)
[C]	R 2.5 mm (0.0984 in.)
[D]	R 2.1 mm (0.0827 in.)

● Measure the crankshaft runout at #3 main journal.
★If the measurement exceeds the service limit, replace the crankshaft.



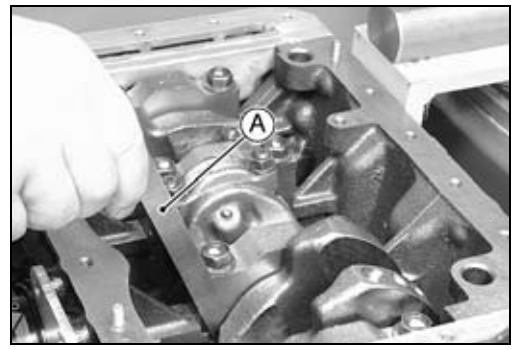
Crankshaft #3 Main Journal Runout
Service Limit: 0.06 mm (0.0024 in.)

● Visually inspect the crankshaft gear teeth [A].
● Do the timing gear inspection procedure (see Timing Gear Inspection).
★If the crankshaft gear teeth are damaged or worn, replace the crankshaft.



Crankshaft and Connecting Rods

Crankshaft Side Clearance

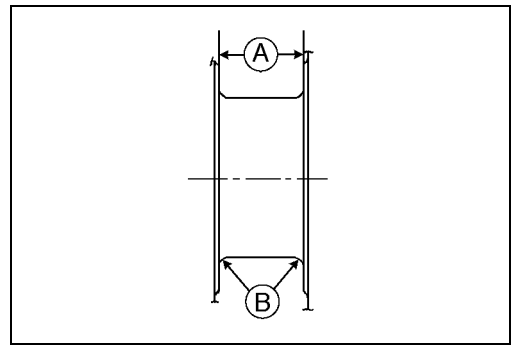


- Insert a thickness gauge [A] between the thrust washer and the crank web at the #3 main journal to determine clearance.

Crankshaft Side Clearance
Standard: 0.02 ~ 0.24 mm (0.0008 ~ 0.0094 in.)
Service Limit: 0.30 mm (0.0118 in.)

★If the clearance exceeds the service limit, the crankshaft may be re-ground and oversize thrust washers installed.

Oversize Thrust Washers
0.12 mm (0.0047 in.) Oversize



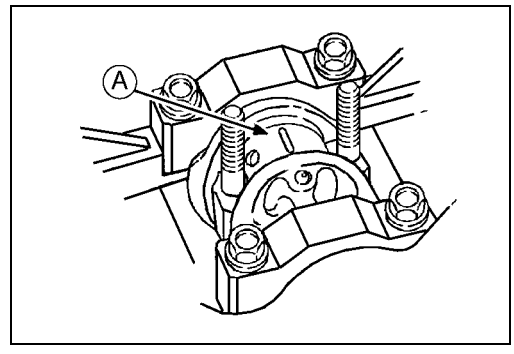
- The final finishing dimensions should be as shown in the table.

Finishing Dimensional Specifications

[A]	22.25 ~ 22.32 mm (0.8760 ~ 0.8787 in.)
[B]	R 2.5 mm (0.0984 in.)

Crankshaft #3 Main Journal Width
Standard: 22.00 ~ 22.07 mm (0.8661 ~ 0.8689 in.)

Connecting Rod Big End Bearing Insert/Crankpin Wear



- Using plastigage (press gauge) [A], measure the bearing insert/crankpin clearance.

NOTE

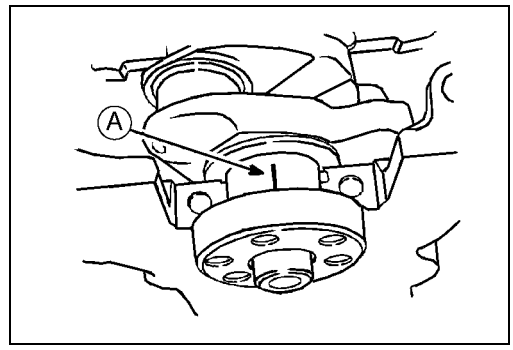
○*Tighten the connecting rod big end nuts to the specified torque (see Connecting Rod Installation).*
○*Do not move the connecting rod and crankshaft during clearance measurement.*

Connecting Rod Big End Bearing Insert/Crankpin Clearance
Standard: 0.020 ~ 0.044 mm (0.0008 ~ 0.0017 in.)
Service Limit: 0.07 mm (0.0028 in.)

★If the clearance exceeds the service limit, replace the bearing insert.
- Repeat the procedure for the other connecting rods.

Crankshaft and Connecting Rods

Crankshaft Main Bearing Insert/Journal Wear



- Using plastigage (press gauge) [A], measure the bearing insert/journal clearance.

NOTE

○*Tighten the crankshaft main bearing cap bolts to the specified torque (see Crankshaft Installation).*

○*Do not turn the crankshaft during clearance measurement.*

Crankshaft Main Bearing Insert/Journal Clearance

Standard: 0.020 ~ 0.044 mm (0.0008 ~ 0.0017 in.)

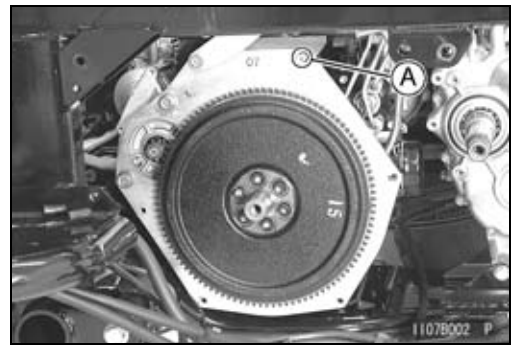
Service Limit: 0.07 mm (0.0028 in.)

★If the clearance exceeds the service limit, replace the bearing insert.

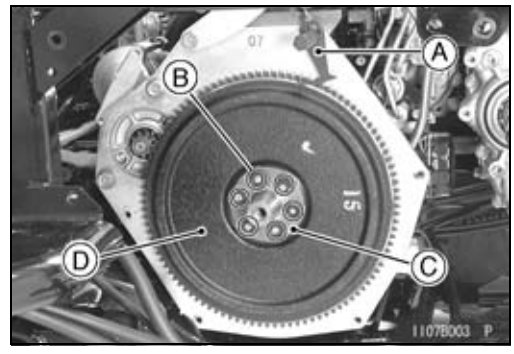
- Repeat the procedure for the other main bearings.

End Plate

End Plate Removal



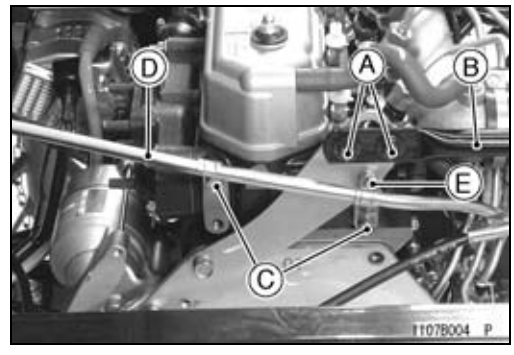
- Remove:
  Torque Converter Case (see Torque Converter Case Removal in the Converter System chapter)
  Stud Bolt [A]



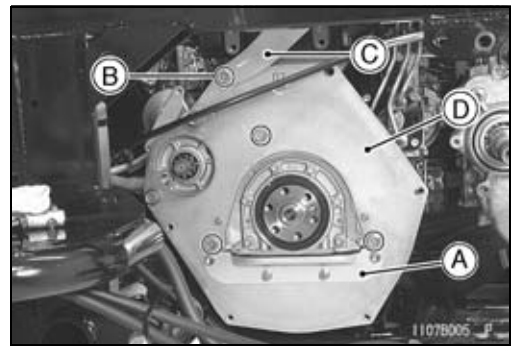
- Using the flywheel holder [A], hold the flywheel.

  Special Tool - Flywheel Holder: 57001-1438

- Remove:
  Flywheel Mounting Bolts [B]
  Coupling [C]
  Flywheel [D]

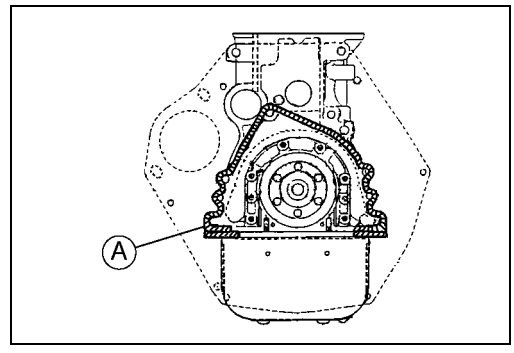


- Remove:
  Bolts [A]
  Engine Mount Stay [B]
  Bolts [C]
  Oil Level Gauge Pipe [D]
  Bolt [E]



- Remove:
  End Plate Seal Cover [A]
  End Plate Bolts [B]
  Plate [C]
  End Plate [D]
  Starter Motor Cables

End Plate Installation



- Remove the old sealant, and clean around the oil seal retainer and crankshaft end.
- Apply liquid gasket [A] to the mating surface as shown in the figure.

  Sealant - Three Bond: 1207F

★When the starter motor install, refer to the Starter Motor Installation in the Electrical System chapter.

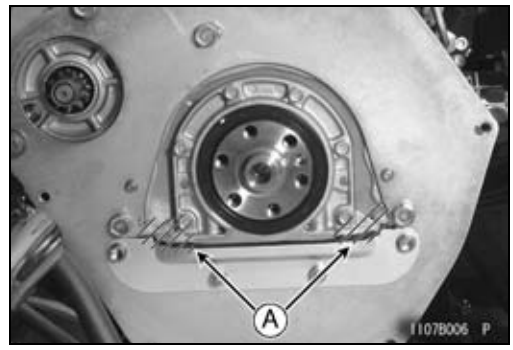
- Install the end plate.
- Tighten:

  Torque - End Plate Bolts: 39 N·m (4.0 kgf·m, 29 ft·lb)

End Plate

- Apply liquid gasket [A] to the mating surface as shown in the figure.

  Sealant - Three Bond: 1207F

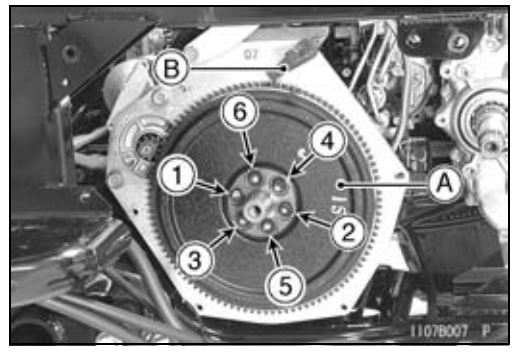


- Install the flywheel [A] and coupling.
- Apply a non-permanent locking agent to the threads of the flywheel mounting bolts.
- Using the flywheel holder [B], hold the flywheel.

  Special Tool - Flywheel Holder: 57001-1438

- Tighten the flywheel mounting bolts following the tightening sequence as shown in the figure.

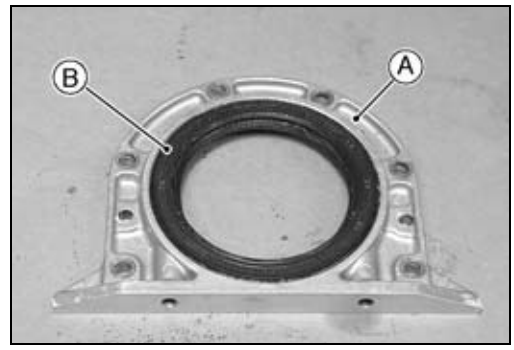
  Torque - Flywheel Mounting Bolts:
  First 32 N·m (3.3 kgf·m, 24 ft·lb)
  Final 44 N·m (4.5 kgf·m, 32 ft·lb)



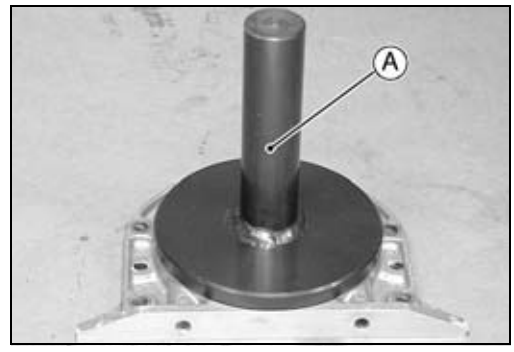
- Install the removed parts (see appropriate chapters).

Oil Seal Retainer

Oil Seal Replacement



- Remove:
  Oil Seal Retainer [A] (see Crankshaft Removal)
  Oil Seal [B]



- Apply engine oil to the outside of the oil seal.
- Press in a new oil seal so that the seal surface is flush with the end of the hole.

Special Tool - Retainer Oil Seal Driver [A]: 57001-1437

○Apply high-temperature grease to the oil seal lips.

Pistons and Crankcase

Piston Removal

- Remove:
  Connecting Rod (see Connecting Rod Removal)
  Snap Rings [A]

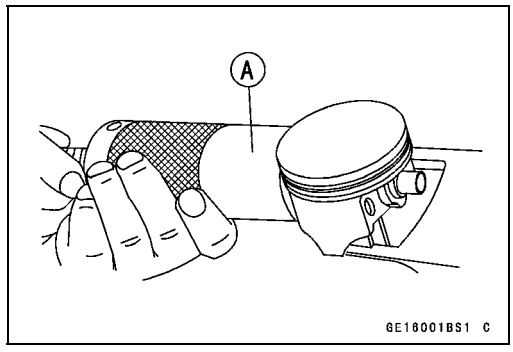
Special Tool - Inside Circlip Pliers: 57001-143



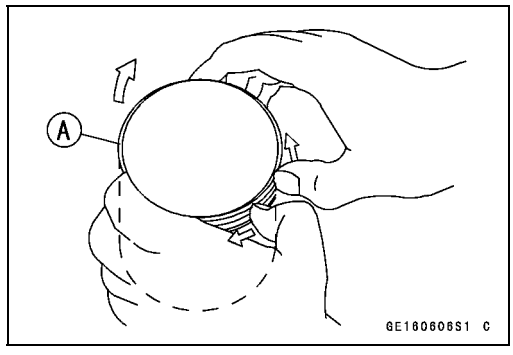
- Remove the piston pin.

Special Tool - Piston Pin Puller Assembly [A]: 57001-910

- Remove the piston.



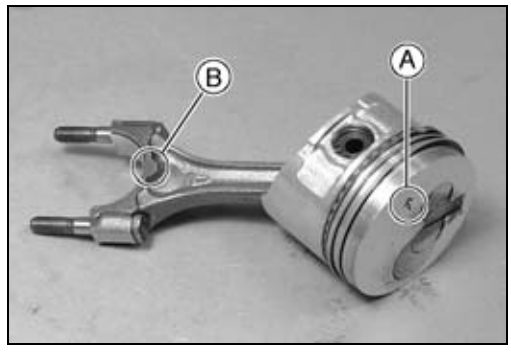
- Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
- Remove the 3-piece oil ring with your thumbs in the same manner.



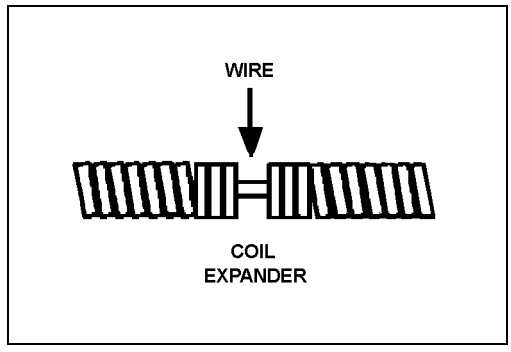
Piston Installation

- Apply engine oil to the piston pin.
- Align the arrow [A] on the piston and ID mark [B] on the connecting rod.
- Install:
  Piston Pin
  New Snap Rings

Special Tool - Inside Circlip Pliers: 57001-143



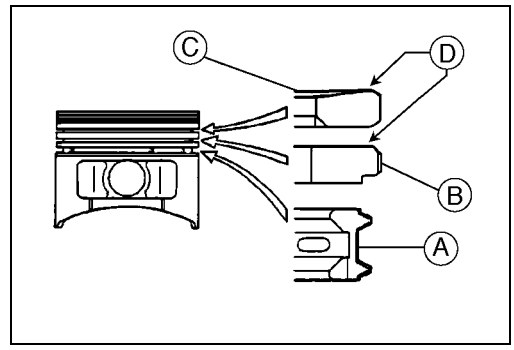
- Install the oil ring coil expander making sure the wire is completely inserted into the coil expander.



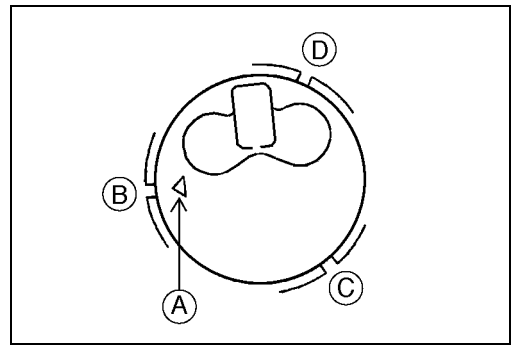
Pistons and Crankcase

● Install:
Oil Ring Coil Expander
Oil Ring [A]
Second Ring [B]
Top Ring [C]

○The second and top rings must be installed with the “T” mark [D] facing up.

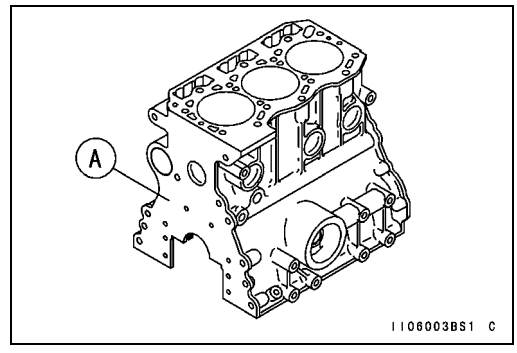


● Position each piston ring end gap as shown in the figure.
Arrow [A]
Top Ring End Gap [B]
Second Ring End Gap [C]
Oil Ring End Gap [D]



Crankcase Removal

● Remove:
Connecting Rods (see Connecting Rod Removal)
Crankshaft (see Crankshaft Removal)
Crankcase [A]

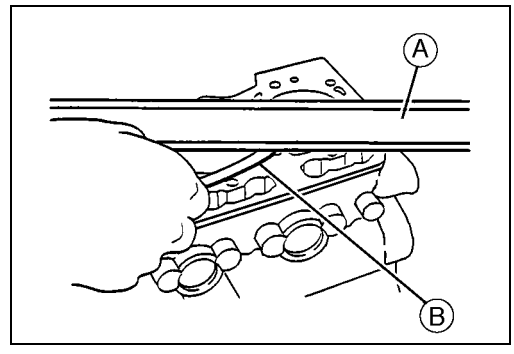


Crankcase Warp

● Clean the crankcase.

● Lay a straightedge [A] across the upper surface of the crankcase at several different points, and measure the warp by inserting a thickness gauge [B] between the straightedge and the crankcase.

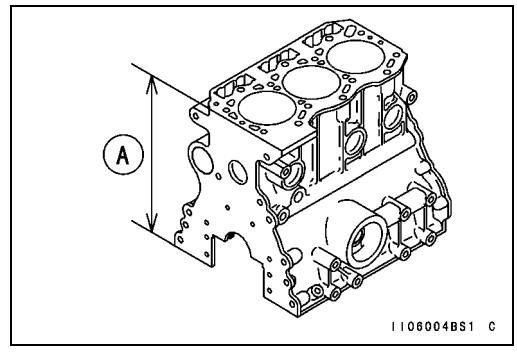
Crankcase Warp
Service Limit: 0.08 mm (0.0031 in.)



★If the warp exceeds the service limit, the crankcase may be resurfaced to the service limit of the crankcase height [A].

Crankcase Height
Standard: 238.70 ~ 239.30 mm (9.3976 ~ 9.4212 in.)
Service Limit: 238.60 mm (9.3937 in.)

★If the height is less than the service limit, replace the crankcase.



Pistons and Crankcase

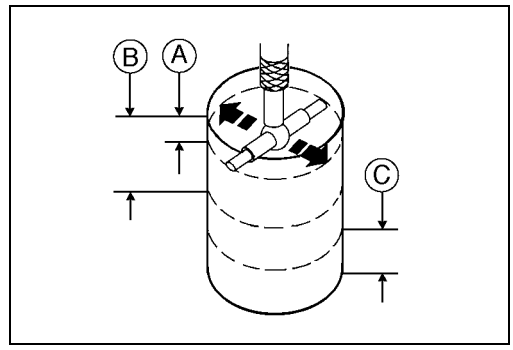
Crankcase Wear

Cylinder Bore

- Take a side-to-side and a front-to-back measurement at each of the 3 locations (total of 6 measurements) shown in the figure.

★If any of the measurements exceeds the service limit, the cylinder will have to be bored to oversize and then honed.

10 mm (0.39 in.) [A]
45 mm (1.77 in.) [B]
20 mm (0.79 in.) [C]



Cylinder Inside Diameter

Standard: **72.00 ~ 72.03 mm (2.8346 ~ 2.8358 in.)**

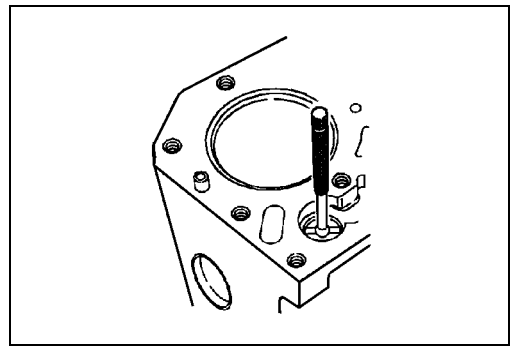
Service Limit: **72.105 mm (2.8388 in.) or more than 0.035 mm (0.0014 in.) difference between any two measurements**

Valve Lifter Bore

Valve Lifter Bore Inside Diameter

Standard: **18.018 mm (0.7094 in.)**

Service Limit: **18.05 mm (0.7106 in.)**

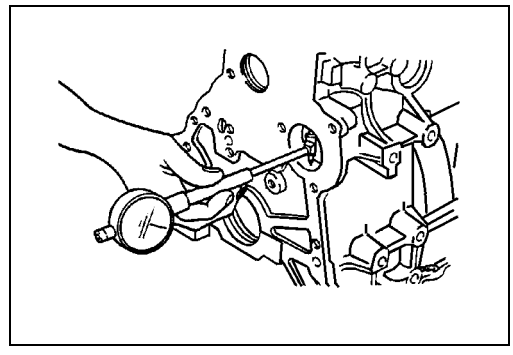


Camshaft Bearing

Camshaft Bearing Inside Diameter

Service Limit: **36.06 mm (1.4197 in.)**

★If the diameter exceeds the service limit, replace the camshaft bearing.



Piston Diameter

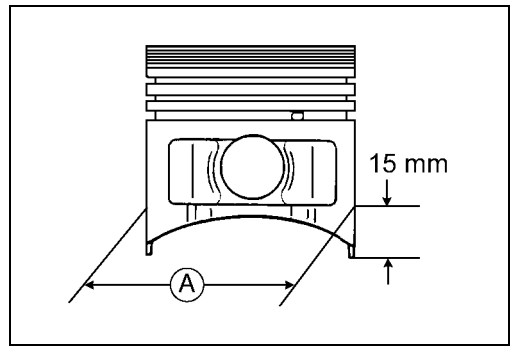
- Measure the piston diameter [A] at the point shown with a micrometer.

Piston Diameter

Standard: **71.93 ~ 71.96 mm (2.8319 ~ 2.8331 in.)**

NOTE

○*If the cylinder has been bored oversize, use the oversize piston diameter.*



Pistons and Crankcase

Piston/Cylinder Clearance

● Subtract the piston diameter from the cylinder inside diameter to get the piston/cylinder clearance.

Piston/Cylinder Clearance

Standard:	**0.06 ~ 0.08 mm (0.0024 ~ 0.0031 in.)**
Service Limit:	**0.12 mm (0.0047 in.)**

★ If the piston/cylinder clearance is greater than the service limit, and the cylinder inside diameter is not more than the service limit, replace the piston.

★ If only a piston is replaced, the clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid piston seizure.

Cylinder Boring, Honing

When boring and honing a cylinder, note the following.

○ Oversize pistons require oversize rings.

Oversize Piston and Rings

0.25 mm (0.0098 in.) Oversize

○ Before boring a cylinder, first measure the exact diameter of the oversize piston, and then, according to the standard clearance in the specifications, determine the rebore diameter. However, if the amount of boring necessary would increase the inside diameter by more than 0.25 mm (0.0098 in.), the crankcase must be replaced.

○ Cylinder inside diameter must not vary more than 0.01 mm (0.00039 in.) at any point.

○ Be wary of measurements taken immediately after boring since the heat affects cylinder diameter.

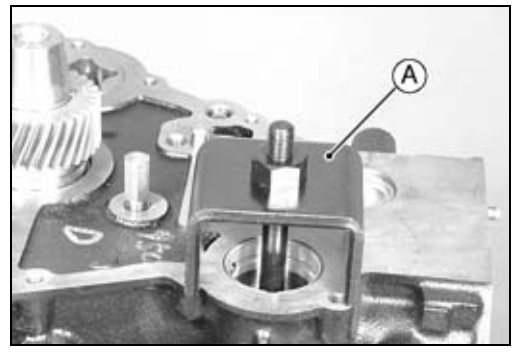
○ In the case of a rebored cylinder and oversize piston, the service limit for the cylinder is the diameter that the cylinder was bored to plus 0.1 mm (0.0039 in.) and the service limit for the piston is the oversize piston original diameter minus 0.15 mm (0.0059 in.). If the exact figure for the rebored diameter is unknown, it can be roughly determined by measuring the diameter at the base of the cylinder.

Camshaft Bearing Replacement

● Remove the timing gear case (see Timing Gear Case Removal).

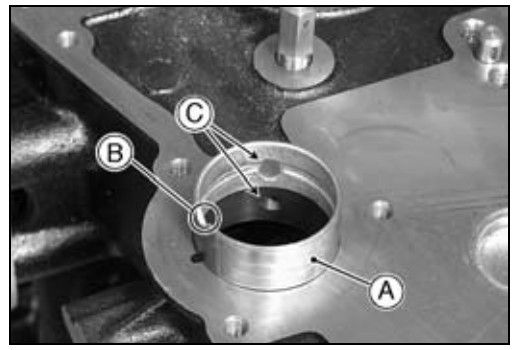
● Using the camshaft bearing remover [A], remove the camshaft bearing.

Special Tool - Camshaft Bearing Remover: 57001-1435



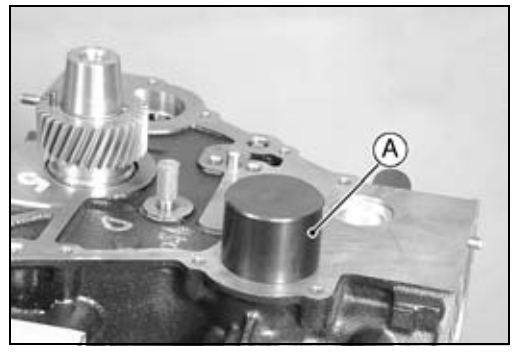
Pistons and Crankcase

● Install the new camshaft bearing [A].
○Face the notch [B] in the bearing to the outside, and align the oil holes [C] in the bearing and crankcase.



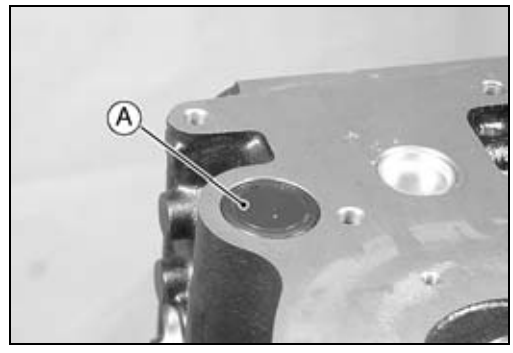
● Using the camshaft bearing driver [A], install the camshaft bearing.

Special Tool - Camshaft Bearing Driver: 57001-1434



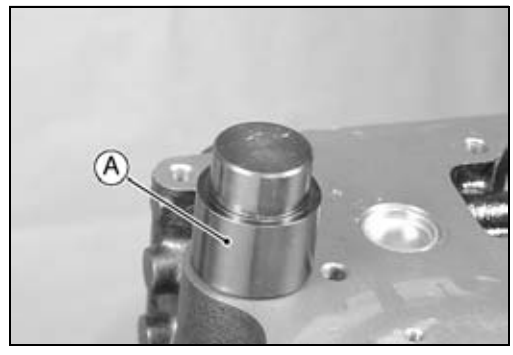
Camshaft Plug Replacement

● Remove:
Timing Gear Case (see Timing Gear Case Removal)
Camshaft Plug [A]
○Use a wooden dowel or brass rod to prevent damage to the camshaft bearing.



● Using the camshaft bearing driver [A], install a new camshaft plug.

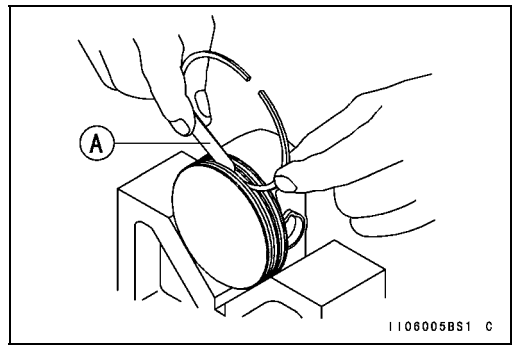
Special Tool - Camshaft Bearing Driver: 57001-1434



Piston Ring and Ring Groove Wear

● Check for uneven groove wear by inspecting the ring seating.
★The rings should fit perfectly parallel to the groove surfaces. If not, replace the piston and all the piston rings.
● With new piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring/groove clearance.

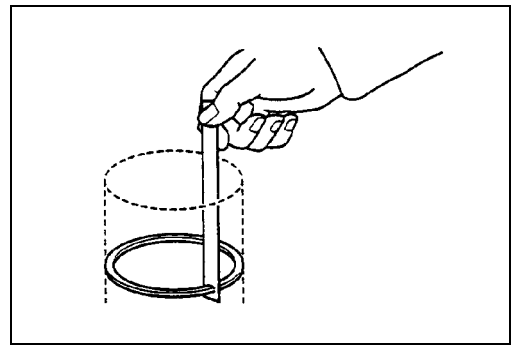
Piston Ring/Groove Clearance (Top, Second and Oil Ring)
Service Limit: less than 0.12 mm (0.0047 in.)



★If the piston ring/groove clearance is greater than the service limit, replace the piston.

Pistons and Crankcase

Piston Ring End Gap



- Clean the carbon from the ends of the rings.
- Place the piston ring inside the cylinder, using the piston to locate the ring squarely in place. Set it close to the bottom of the cylinder, where cylinder wear is low.
- Measure the gap between the ends of the ring with a thickness gauge.

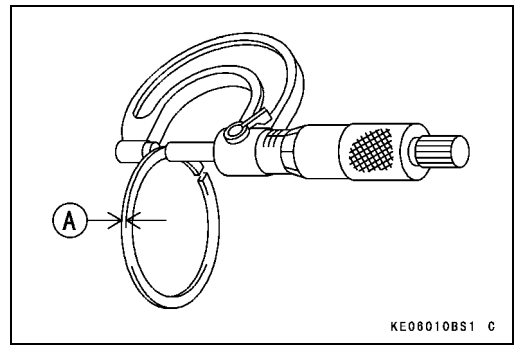
Piston Ring End Gap (Top, Second and Oil Ring)
Service Limit: 0.70 mm (0.0276 in.)

★If the gap is wider than the service limit, the ring is overworn and must be replaced.

NOTE

○*When using new rings in a used piston, check for uneven groove wear. The rings should fit perfectly parallel to the groove sides. If not, replace the piston.*

Piston Ring Thickness



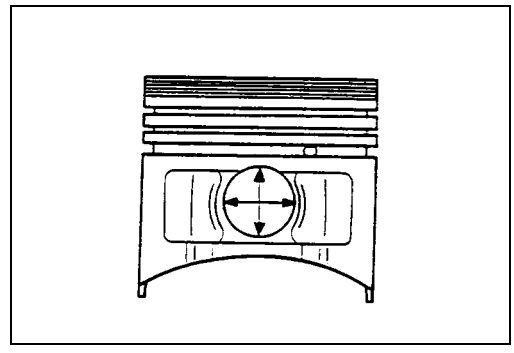
- Measure the piston ring thickness [A].

○Use a micrometer to measure at several points around the ring.

Piston Ring Thickness
Standard:

Top	**1.445 ~ 1.465 mm (0.0569 ~ 0.0577 in.)**
Second	**1.470 ~ 1.490 mm (0.0579 ~ 0.0587 in.)**
Oil	**2.970 ~ 2.990 mm (0.1169 ~ 0.1177 in.)**

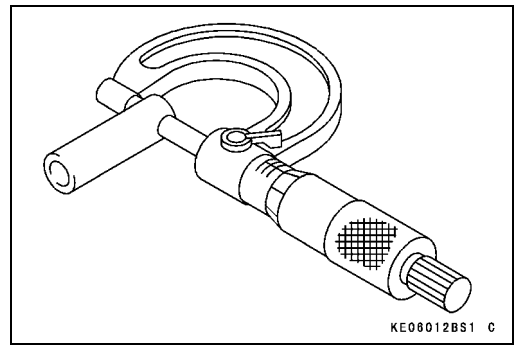
Piston and Piston Pin Wear



- Measure the inside diameter of the piston pin bore.

★If the inside diameter exceeds the service limit, replace the piston.

Piston Pin Bore Diameter
Service Limit: 18.03 mm (0.7098 in.)



- Measure the outside diameter of the piston pin.

★If the outside diameter is less than the service limit, replace the piston pin.

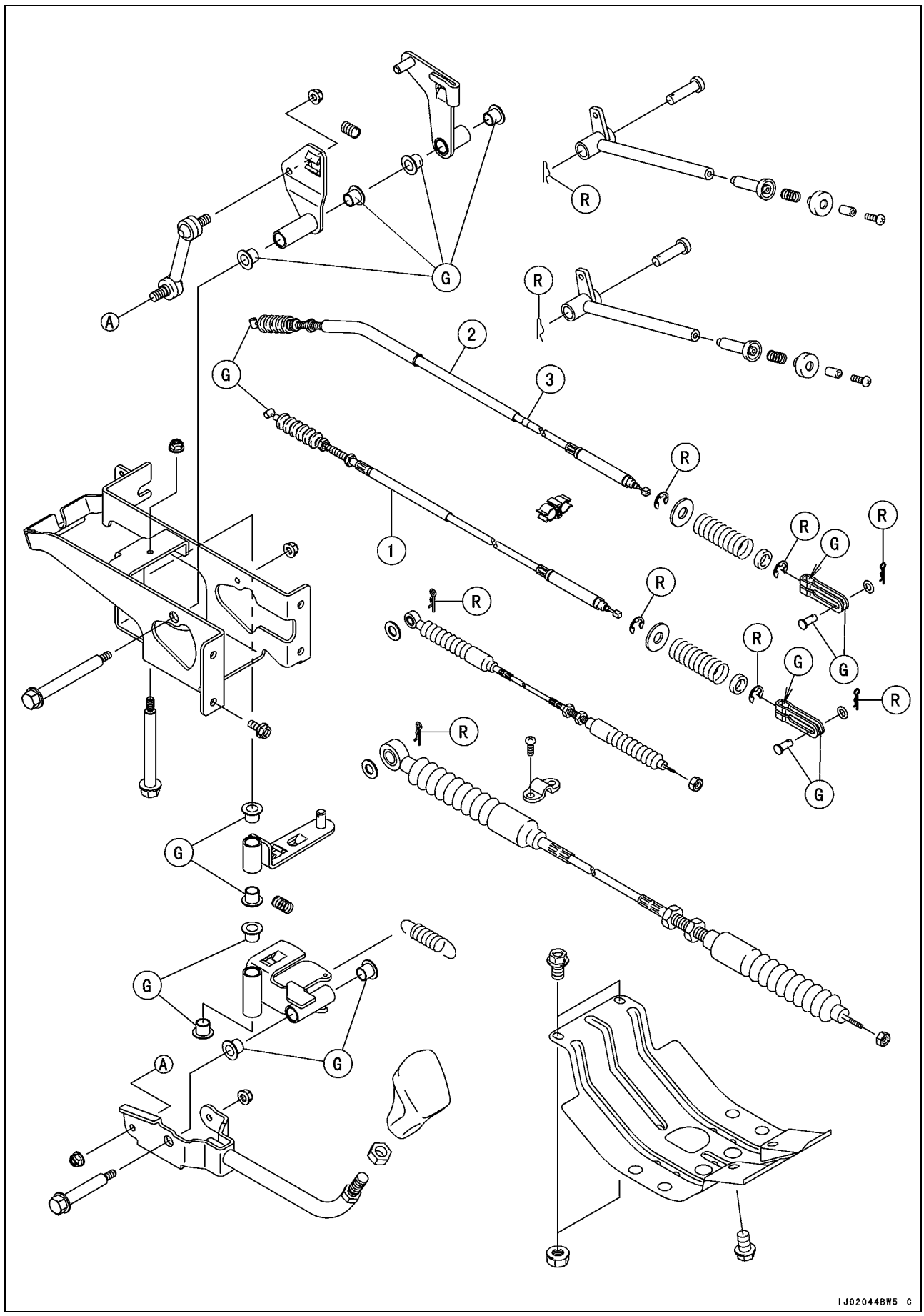
Piston Pin Diameter
Service Limit: 17.98 mm (0.7079 in.)

Transmission

Table of Contents

Exploded View 10-2
Specifications 10-8
Special Tools and Sealant 10-9
Transmission Oil 10-10
  Transmission Oil Level Inspection 10-10
  Transmission Oil Change 10-10
Transmission Case 10-11
  Transmission Case Removal 10-11
  Transmission Case Installation 10-12
  Transmission Case Splitting 10-13
  Transmission Case Assembly 10-13
Transmission and Shift Mechanism 10-14
  Transmission and Hi/Low Shift Cables Installation 10-14
  Shift Lever Position Inspection 10-17
  Shift Lever Position Adjustment 10-17
  Transmission Shift Cable Inspection 10-18
  Transmission Removal 10-18
  Transmission Installation 10-19
  Transmission and Shift Mechanism Inspection 10-20
Hi/Low Gears and Shift Mechanism 10-21
  Hi/Low Shift Cable Installation 10-21
  Hi/Low Shift Cable Inspection 10-21
  Hi/Low Gear and Shift Mechanism Removal 10-21
  Hi/Low Gear and Shift Mechanism Installation 10-22
  Hi/Low Gear and Shift Mechanism Inspection 10-24
2WD/4WD Shift Mechanism 10-25
  2WD/4WD Shift Cable Adjustment 10-25
  2WD/4WD Shift Cable Lubrication 10-25
  2WD/4WD Shift Cable Inspection 10-26
  2WD/4WD Shift Mechanism Removal 10-26
  2WD/4WD Shift Mechanism Installation 10-26
  2WD/4WD Shift Mechanism Inspection 10-28
Differential Gears and Shift Mechanism 10-29
  Differential Shift Cable Adjustment 10-29
  Differential Shift Cable Lubrication 10-29
  Differential Shift Cable Inspection 10-29
  Differential Shift Mechanism Removal 10-29
  Differential Shift Mechanism Installation 10-30
  Differential Shift Mechanism Inspection 10-30
  Differential Gear Removal 10-31
  Differential Gear Installation 10-32
  Differential Gear Inspection 10-32
Bearings and Oil Seal 10-33
  Bearing Replacement 10-33
  Ball Bearing Inspection 10-33
  Needle Bearing Inspection 10-33
  Oil Seal Inspection 10-33
Transmission Sectional Figure 10-34

Exploded View

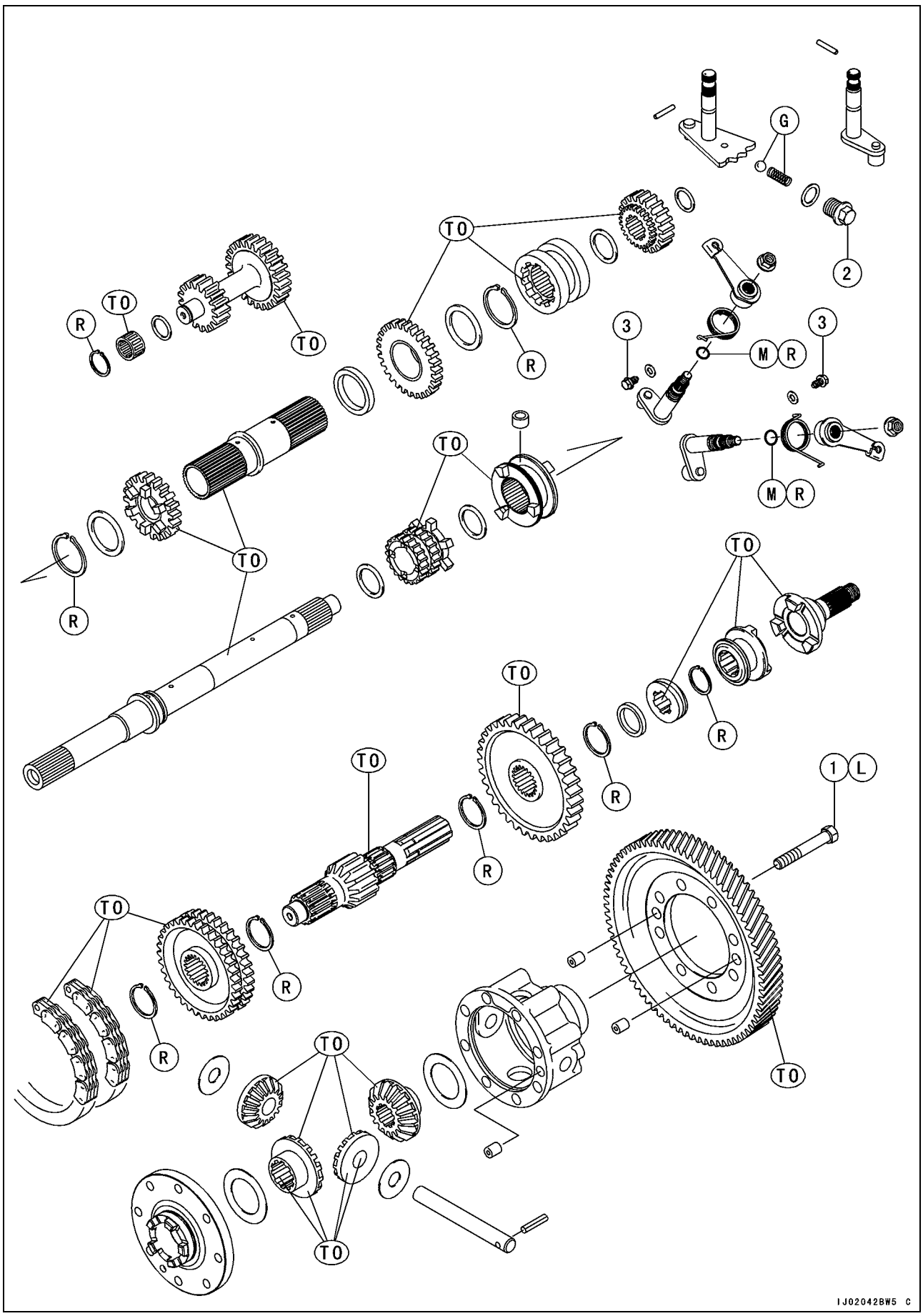


Exploded View

1. 2WD/4WD Shift Cable
2. Differential Shift Cable
3. White Tape

G: Apply grease.
R: Replacement Parts

Exploded View

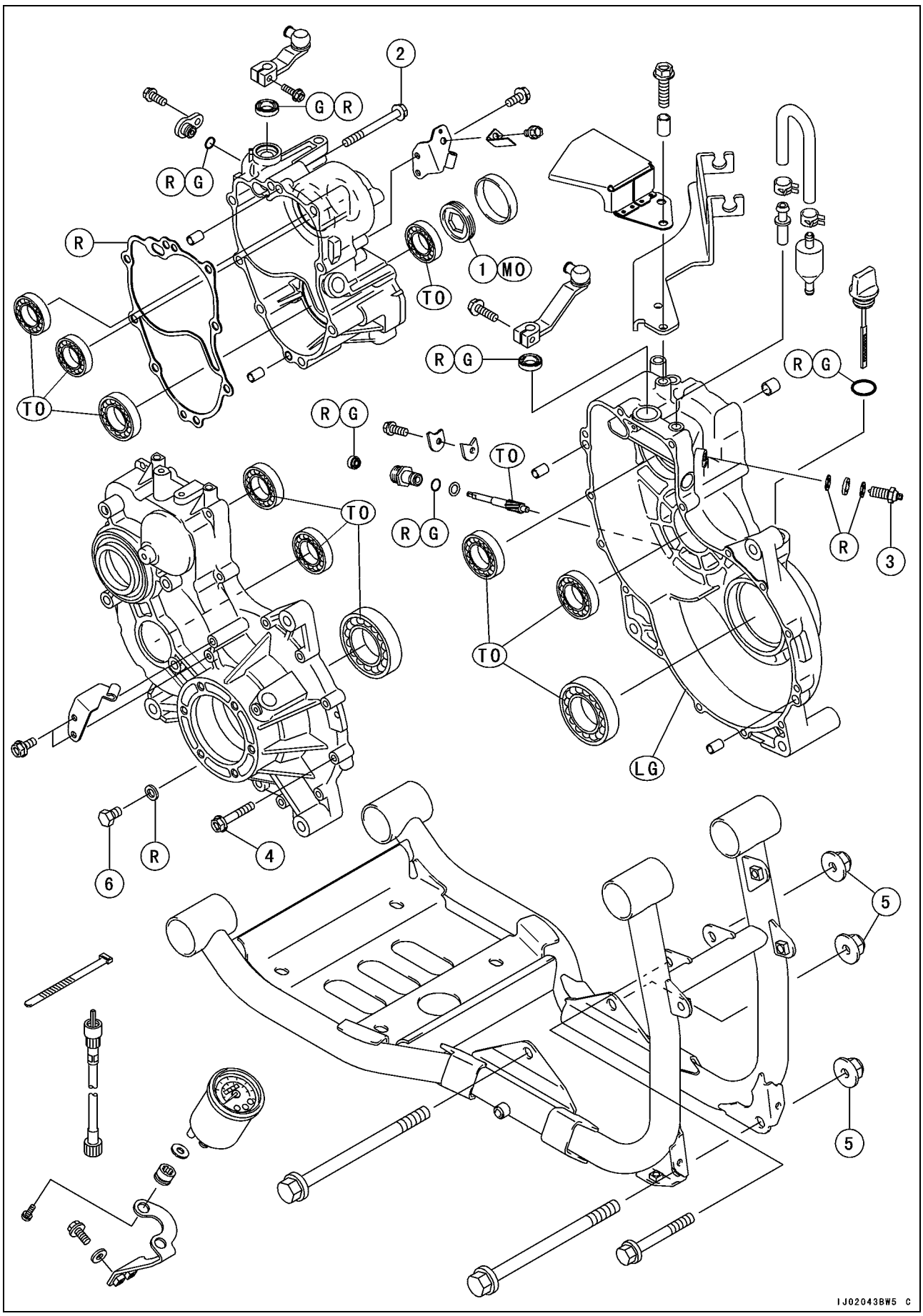


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Differential Gear Housing Bolts	57	5.8	42	L
2	Shift Arm Positioning Bolt	37	3.8	27	
3	Shift Shaft Stop Bolts	7.8	0.80	69 in·lb	

G: Apply grease.
L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
R: Replacement Parts
TO: Apply transmission oil.

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Bearing Holder	118	12.0	87.0	MO
2	Hi/Low Gear Case Bolts	20	2.0	15	
3	Neutral Switch	15	1.5	11	
4	Transmission Case Bolts	8.8	0.90	78 in·lb	
5	Transmission Case Mounting Nuts	44	4.5	32	
6	Transmission Oil Drain Plug	15	1.5	11	

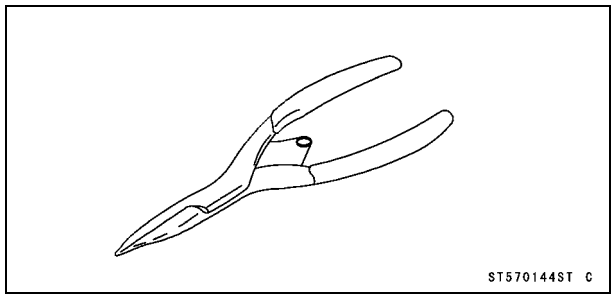
G: Apply grease.
LG: Apply liquid gasket.
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1).
R: Replacement Parts
TO: Apply transmission oil.

Specifications

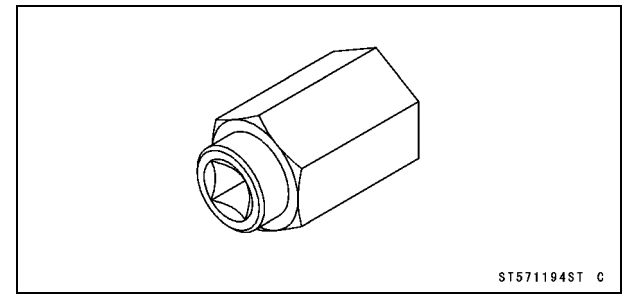
Item	Standard	Service Limit
Transmission Oil		
Type	Hypoid gear oil	– – –
Viscosity	SAE 90: above 5°C (41°F) or	– – –
	SAE 80: below 5°C (41°F)	– – –
Capacity	2.5 L (2.6 US qt)	– – –
Oil Level	Between H and L level lines on dipstick	– – –
Transmission and Shift Mechanism		
Shift Arm Pin Diameter	7.95 ~ 8.00 mm (0.313 ~ 0.315 in.)	7.8 mm (0.307 in.)
Shifter Block Inside Diameter	8.05 ~ 8.10 mm (0.317 ~ 0.319 in.)	8.2 mm (0.323 in.)
Shifter Block Outside Diameter	13.95 ~ 14.00 mm (0.549 ~ 0.551 in.)	13.8 mm (0.543 in.)
Shifter Groove Width	14.0 ~ 14.2 mm (0.551 ~ 0.559 in.)	14.3 mm (0.563 in.)
Drive Chain 20-Link Length	158.76 ~ 159.18 mm (6.250 ~ 6.267 in.)	161.1 mm (6.343 in.)
Hi/Low Gears and Shift Mechanism		
Shifter Block Outside Diameter	13.95 ~ 14.00 mm (0.549 ~ 0.551 in.)	13.8 mm (0.543 in.)
Shifter Groove Width	14.05 ~ 14.15 mm (0.553 ~ 0.557 in.)	14.3 mm (0.563 in.)
2WD/4WD Shift Mechanism		
Shifter Block Outside Diameter	13.95 ~ 14.00 mm (0.549 ~ 0.551 in.)	13.8 mm (0.543 in.)
Shifter Groove Width	14.0 ~ 14.2 mm (0.551 ~ 0.559 in.)	14.3 mm (0.563 in.)
Differential Gears and Shift Mechanism		
Shift Arm Pin Diameter	8.4 ~ 8.6 mm (0.331 ~ 0.339 in.)	8.3 mm (0.327 in.)
Shifter Groove Width	9.0 ~ 9.1 mm (0.354 ~ 0.358 in.)	9.2 mm (0.362 in.)

Special Tools and Sealant

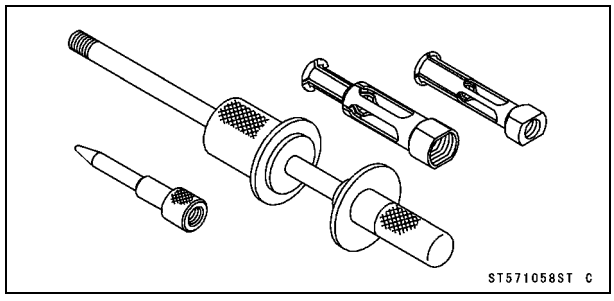
Outside Circlip Pliers:
57001-144



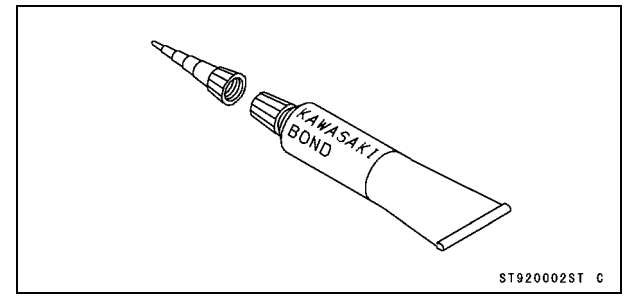
Hexagon Wrench, Hex 32:
57001-1194



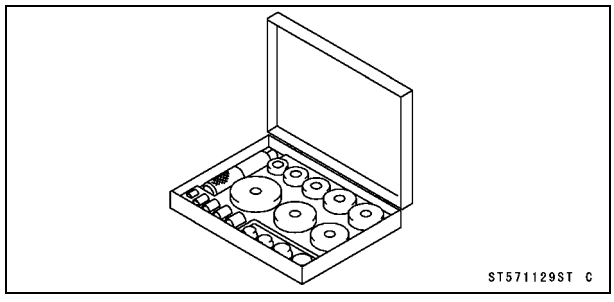
Oil Seal & Bearing Remover:
57001-1058



Kawasaki Bond (Liquid Gasket - Silver):
92104-002



Bearing Driver Set:
57001-1129

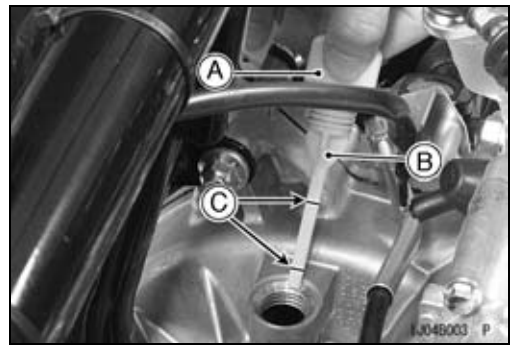


Transmission Oil

CAUTION

Vehicle operation with insufficient, deteriorated or contaminated transmission oil will cause accelerated wear and may result in transmission failure.

Transmission Oil Level Inspection



NOTE

○*If the vehicle has just been used wait several minutes for all the oil to settle down.*

- Park the vehicle on level ground, and tilt up the cargo bed.
- Unscrew the oil filler cap [A], wipe its dipstick [B] dry, and insert it into the filler opening but DO NOT SCREW IT IN.
- Pull out the dipstick and check the oil level. The oil level should be between the upper (H) and lower (L) level lines [C].

★If the oil level is too high, remove the excess oil, using a syringe or some other suitable device, through the oil filler opening.

★If the oil level is too low, add the necessary amount of oil through the oil filler opening. Use the same type and make of oil that is already in the transmission.

NOTE

○*If the transmission oil type and make are unknown, use any brand of the specified oil to top up the level in preference to running the transmission with the oil level low. Then, at your earliest convenience, change the oil completely.*

Transmission Oil Change

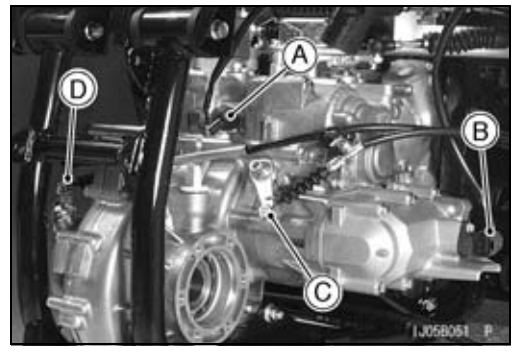
- Refer to the Transmission Oil Change in the Periodic Maintenance chapter.

Transmission Case

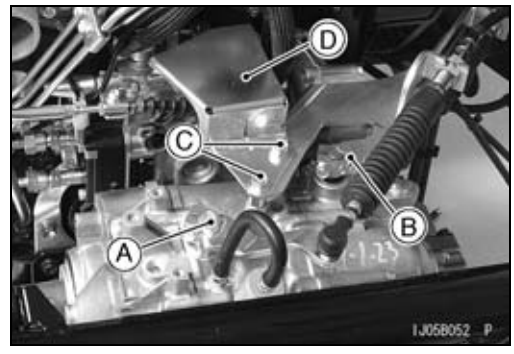
Transmission Case Removal

- Drain the transmission oil (see Transmission Oil Change in the Periodic Maintenance chapter).
- Remove:
  Cargo Bed (see Cargo Bed Removal in the Frame chapter)
  Propeller Shaft (see Propeller Shaft Removal in the Final Drive chapter)
  Torque Converter Case (see Torque Converter Case Removal in the Converter System chapter)
  Rear Drive Shafts and Axles (see Rear Drive Shaft and Axle Removal in the Final Drive chapter)
  Muffler (see Muffler Removal in the Engine Top End chapter)

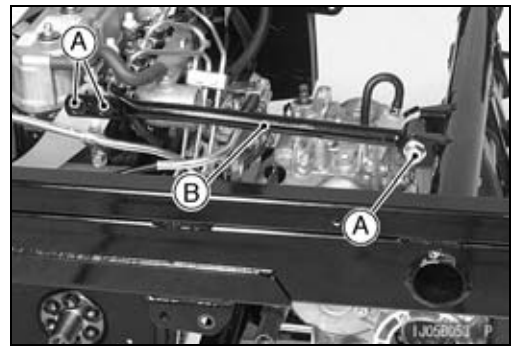
- Remove:
  Neutral Switch Terminal Lead [A]
  Speed Sensor Lead Connector [B]
  2WD/4WD Shift Cable Lower End [C]
  Differential Shift Cable Lower End [D]



- Remove:
  Transmission Shift Cable Lower End Lever [A]
  Hi/Low Shift Cable Lower End Lever [B]
  Bolts [C] and Collars
  Injection Pump Cover [D]

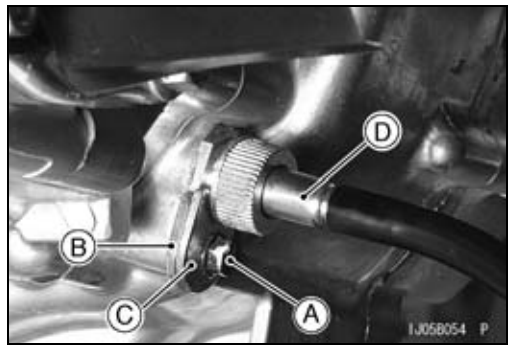


- Remove:
  Bolts and Nuts [A]
  Engine Mount Stay [B]

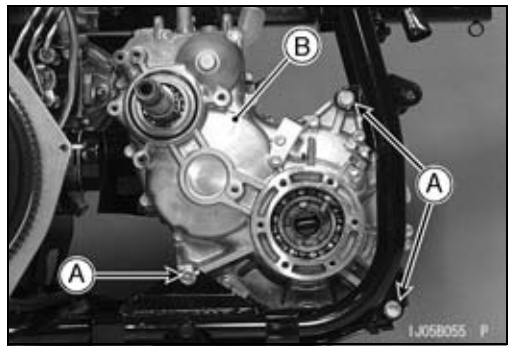


Transmission Case

- Remove:
  Bolt [A]
  Thick Holder [B]
  Thin Holder [C]
  Speedometer Cable Lower End [D]



- Remove:
  Transmission Case Mounting Bolts and Nuts [A]
  Transmission Case [B]

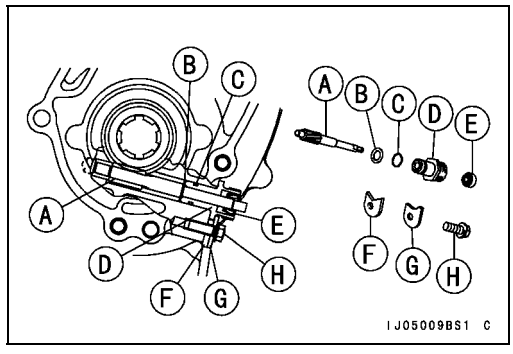


Transmission Case Installation

- Adjust the transmission case mounting position (see Engine Installation in the Engine Removal/Installation chapter).
- Tighten:

Torque - Transmission Case Mounting Nuts: 44 N·m (4.5 kgf·m, 32 ft·lb)

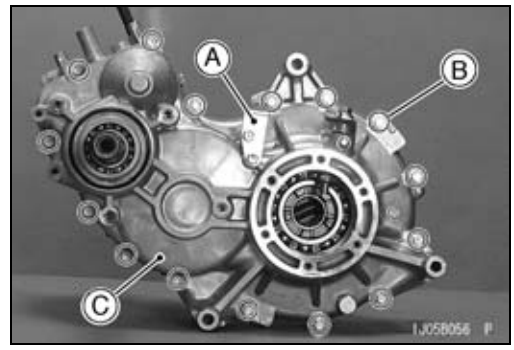
- Install:
  Speedometer Gear [A]
  Washer [B]
  O-ring [C]
  Bushing [D]
  Oil Seal [E]
  Thick Holder [F]
  Thin Holder [G]
  Bolt [H]



- Adjust:
  Transmission Oil (see Transmission Oil Change in the Periodic Maintenance chapter)
  Transmission Shift Cable (see Shift Lever Position Adjustment)
  Differential Shift Cable (see Differential Shift Cable Adjustment)
  Hi/Low Shift Cable (see Shift Lever Position Adjustment)
  2WD/4WD Shift Cable (see 2WD/4WD Shift Cable Adjustment)

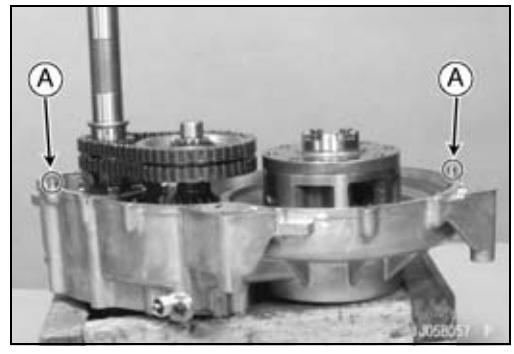
Transmission Case

Transmission Case Splitting



- Remove:
  Transmission Case (see Transmission Case Removal)
  Bevel Gear Case (see Bevel Gear Case Removal in the Final Drive chapter)
  Hi/Low Gear Case (see Hi/Low Gear and Shift Mechanism Removal)
  Cable Bracket [A]
  Bolts [B]
  Left Transmission Case [C]

Transmission Case Assembly



- Check to see that the transmission case dowel pins [A] are in place. If any one of them has been removed, replace it with a new one.
- Apply liquid gasket to the transmission case mating surface.

  Sealant - Kawasaki Bond (Liquid Gasket - Silver): 92104 - 002

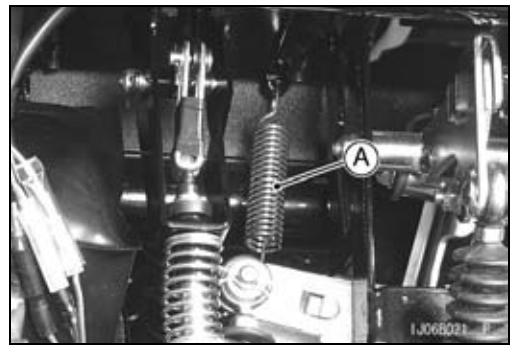
- Apply grease to the oil seal lips
- Tighten:

  Torque - Transmission Case Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

Transmission and Shift Mechanism

Transmission and Hi/Low Shift Cables Installation

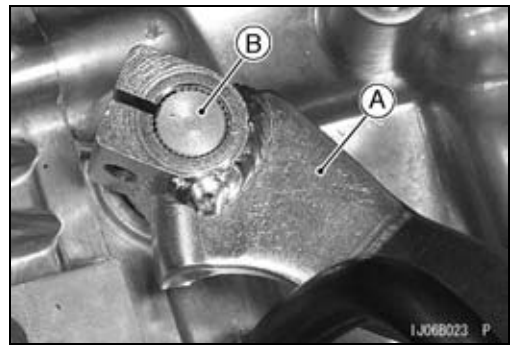
- Remove one side of the spring [A] from the shift shaft lever assembly.



- Put the shift lever [A] in the “L” (LOW) position.



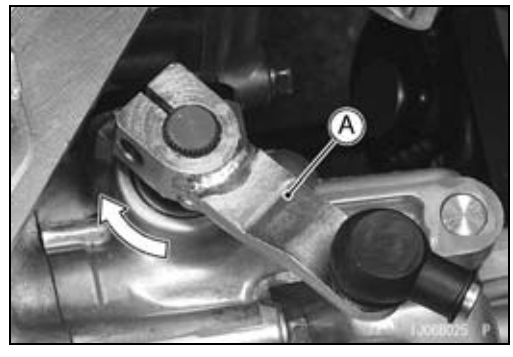
- Using the shift shaft lever [A] temporarily set the shift arm [B] in forward or reverse position as shown in the figure.



- Put the differential shift lever [A] in “LOCK” position.

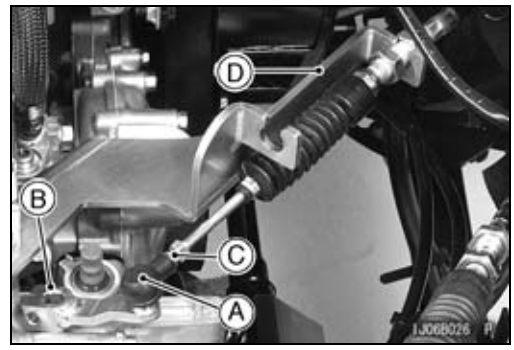


- Turn the hi/low shift shaft lever [A] clockwise while turning the drive shafts (wheels) until the lever engages low gear.

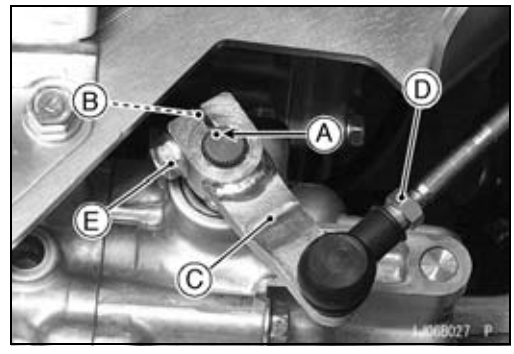


Transmission and Shift Mechanism

- Screw the joint [A] of the shift shaft lever [B] fully into the hi/low shift cable [C] end, and install the cable onto the bracket [D].



- Line up the punch mark [A] on the shift arm, projection [B] on the transmission case and slit opening in the shift shaft lever [C].
- Tighten:
  Shift Shaft Lever Nut [D]
  Shift Shaft Lever Clamp Bolt [E]



- Hold the shift shaft lever [A] in the low range position turning fully clockwise, and then push the outer cable [B] lightly rearward to remove the cable free play.
- Tighten:
  Hi/Low Shift Cable Adjuster Nut [C]
  Hi/Low Shift Cable Adjuster Nut [D]

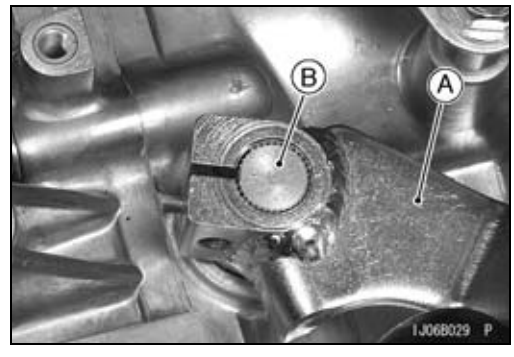


- Put the shift lever [A] in the center of right and left at “N” (NEUTRAL) position, and hold it at the location [B].

○Install suitable plates [C] between the shift lever and lower and upper side of the gate in order to fix the shift lever.

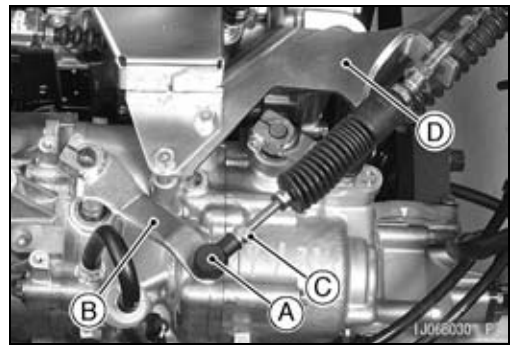


- Using the shift shaft lever [A] temporarily set the shift arm [B] in neutral position as shown in the figure.

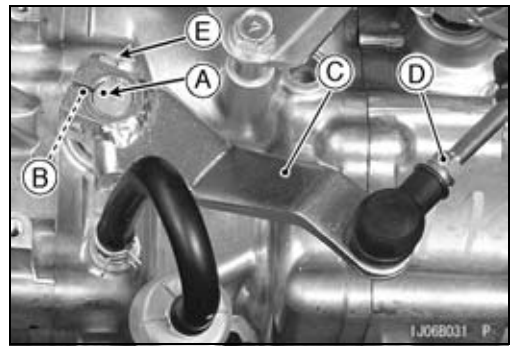


Transmission and Shift Mechanism

- Screw the joint [A] of the shift shaft lever [B] fully into the transmission shift cable [C] end, and install the cable onto the bracket [D].



- Line up the punch mark [A] on the shift arm, projection [B] on the transmission case and slit opening in the shift shaft lever [C].
- Tighten:
  Shift Shaft Lever Nut [D]
  Shift Shaft Lever Clamp Bolt [E]

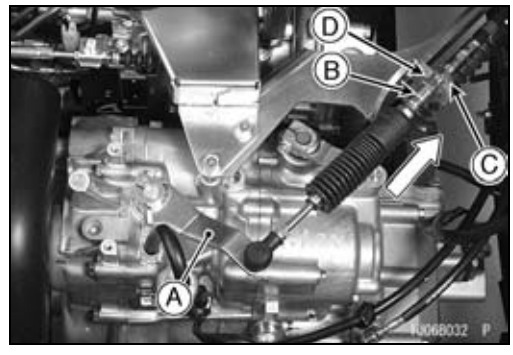


- Hold the shift shaft lever [A] in the neutral position, and then pull the outer cable [B] lightly forward to remove the cable free play.

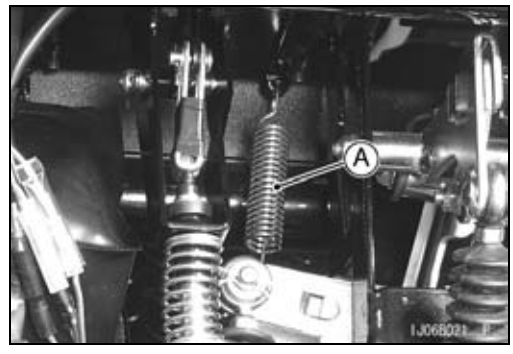
NOTE

○*If the cable cannot be adjusted, move the slit opening in the shift shaft lever one notch to right side of the punch mark on the shift arm.*

- Tighten:
  Transmission Shift Cable Adjuster Nut [C]
  Transmission Shift Cable Adjuster Nut [D]



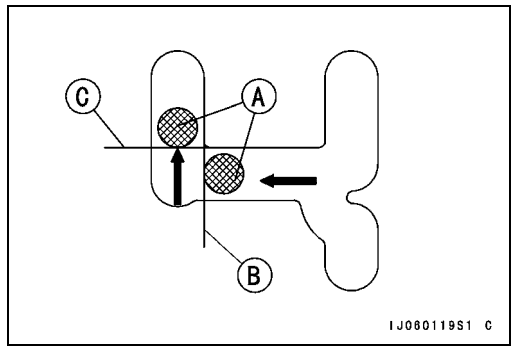
- Install the spring [A] back onto the shift shaft lever assembly.



- Check the shift lever position (see Shift Lever Position Inspection).

Transmission and Shift Mechanism

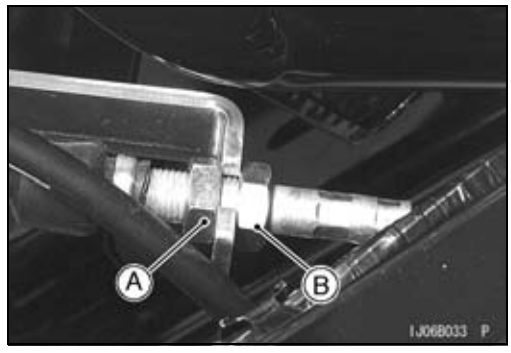
Shift Lever Position Inspection



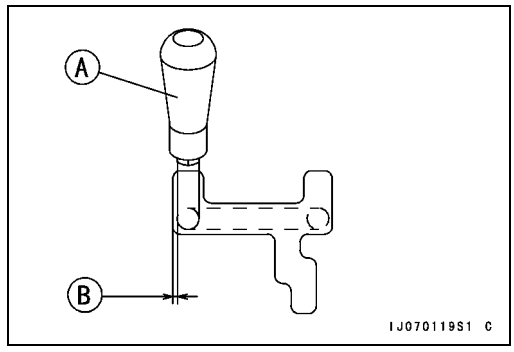
- Start the engine and put the shift lever in “N” (NEUTRAL) or “L” (LOW) position.
- Move the shift lever [A] slowly to the direction of the arrow on the figure. At this time, increase the engine speed slightly.
- Check the grinding noise at the specified positions [B] and [C].

★If the position of the grinding noise is far from the specified position, adjust the shift lever position (see Shift Lever Position Adjustment).

Shift Lever Position Adjustment



- Loosen the hi/low shift cable adjuster nuts [A] and [B].

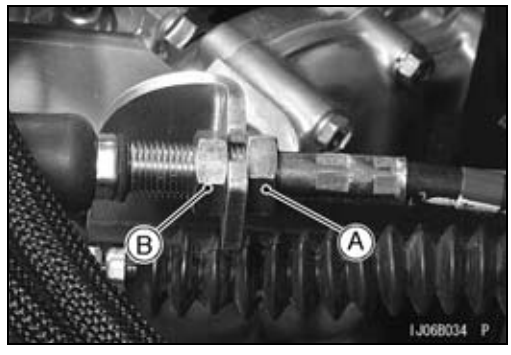


- Adjust the hi/low shift cable and set the transmission shift lever [A] in the correct position as follows.
- The gap [B] between the shift lever and panel is approximate 1.5 mm (0.06 in.).

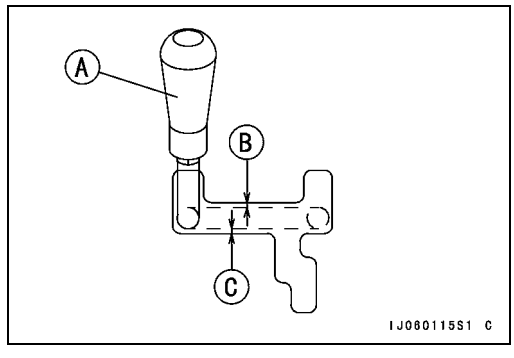
○When the outer cable moving forward, the shift lever moves left side.

○When the outer cable moving rearward, the shift lever moves right side.

- Tighten the hi/low shift cable adjuster nuts.



- Loosen the transmission shift cable adjuster nuts [A] and [B].



- Adjust the transmission shift cable and set the transmission shift lever [A] in the correct position as follows.

○When the shift lever moving to right and left, the gaps between [B] and [C] are same.

○When the outer cable moving forward, the shift lever moves upward.

○When the outer cable moving rearward, the shift lever moves downward.

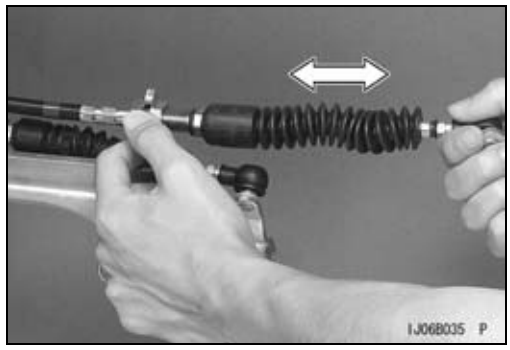
- Tighten the transmission shift cable adjuster nuts.

Transmission and Shift Mechanism

Transmission Shift Cable Inspection

- With the cable disconnected at both ends, the cable should move freely within the cable housing.

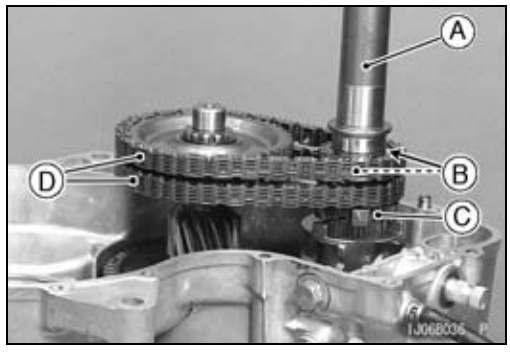
★If the cable movement is not free, if the cable is frayed, or if the housing is kinked, replace the cable.



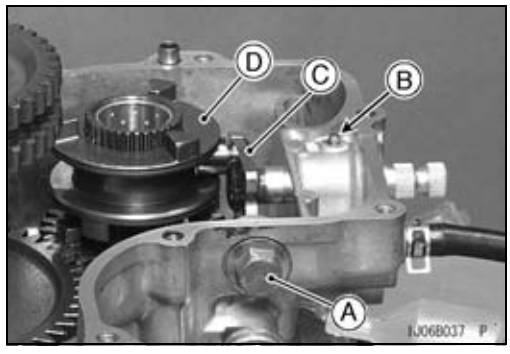
Transmission Removal

- Remove:
  Transmission Case (see Transmission Case Removal)
  Hi/Low Shift Gear (see Hi/Low Gear and Shift Mechanism Removal)
  Speedometer Gear (see 2WD/4WD Shift Mechanism Removal)
- Split the transmission case (see Transmission Case Splitting)

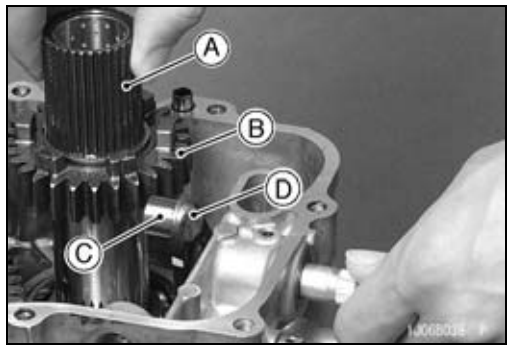
- Remove:
  Differential Gear Assembly (see Differential Gear Removal)
  Drive Shaft [A]
  Washers [B]
  Drive Shaft Reverse Sprocket [C]
  Drive Chains [D]



- Remove:
  Shift Arm Positioning Bolt Assembly [A]
  Retaining Pin [B]
- Lift the shift arm [C] and remove the shifter [D].

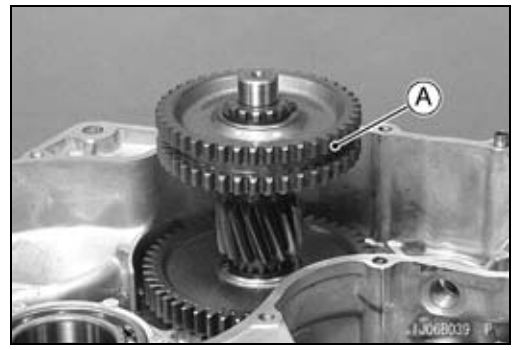


- Remove:
  Drive Shaft (Outer) [A] and Drive Shaft Forward Gear [B]
  Shifter Block [C]
  Shift Arm [D]



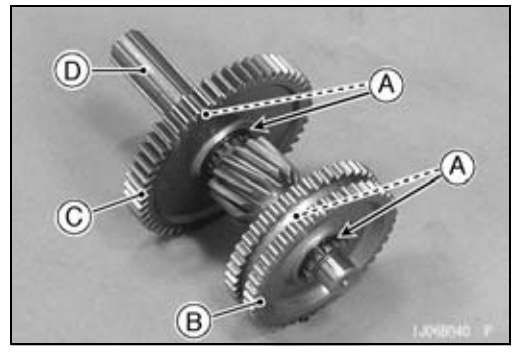
Transmission and Shift Mechanism

● Remove the driven shaft assembly [A].



● Remove:
Circlips [A]
Driven Shaft Reverse Sprocket [B]
Driven Shaft Forward Gear [C]
Driven Shaft [D]

Special Tool - Outside Circlip Pliers: 57001-144

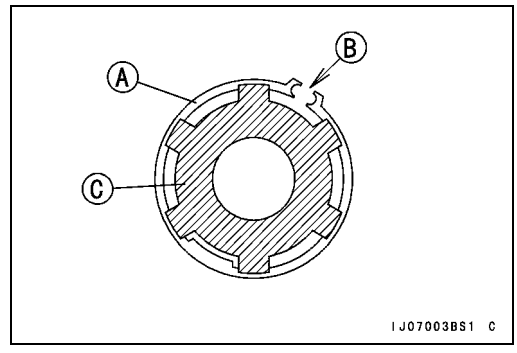


Transmission Installation

● Replace all circlips that were removed with new ones.

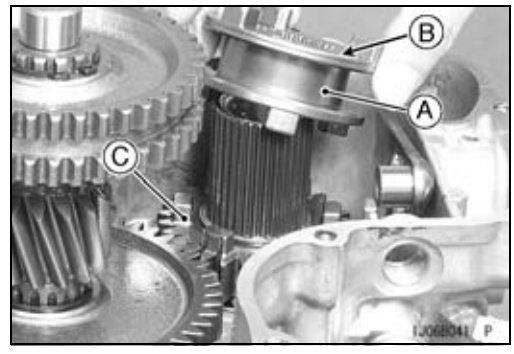
NOTE

○*Always install the circlips [A] so that the opening [B] is aligned with a spline groove. To install a circlip without damage, first fit the circlip onto the shaft [C] and then expand it just enough to install. Hence, use a suitable gear to push the circlip into place.*



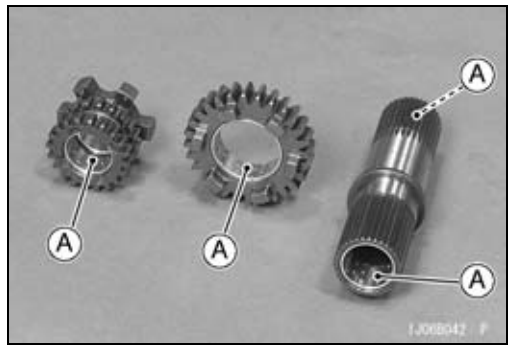
● Apply transmission oil to the following parts.
Drive and Driven Shafts
Forward Gears
Reverse Sprockets
Drive Chains
● Apply grease to the following parts.
Oil Seal Lips
Shift Arm Positioning Ball and Spring
● Install the shifter [A] so that the groove [B] is away from the forward gear [C].
● Tighten:

Torque - Shift Arm Positioning Bolt: 37 N·m (3.8 kgf·m, 27 ft·lb)



Transmission and Shift Mechanism

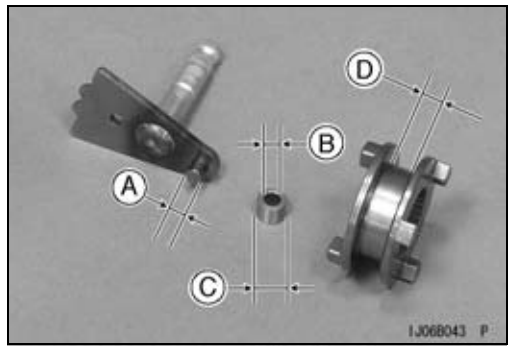
Transmission and Shift Mechanism Inspection



- Visually inspect the forward gears, reverse sprockets, gear and shaft bushings [A], drive chains, and shifter.

★If they are damaged or worn excessively, replace them.

- Replace parts worn beyond the service limit.



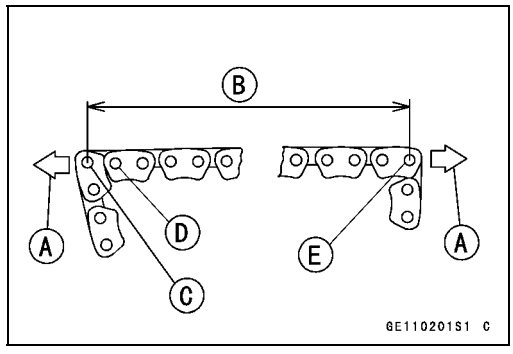
Shift Arm Pin Diameter [A]
Standard: **7.95 ~ 8.00 mm (0.313 ~ 0.315 in.)**
Service Limit: **7.8 mm (0.307 in.)**

Shifter Block Inside Diameter [B]
Standard: **8.05 ~ 8.10 mm (0.317 ~ 0.319 in.)**
Service Limit: **8.2 mm (0.323 in.)**

Shifter Block Outside Diameter [C]
Standard: **13.95 ~ 14.00 mm (0.549 ~ 0.551 in.)**
Service Limit: **13.8 mm (0.543 in.)**

Shifter Groove Width [D]
Standard: **14.0 ~ 14.2 mm (0.551 ~ 0.559 in.)**
Service Limit: **14.3 mm (0.563 in.)**

Drive Chain 20-Link Length [B]
Standard: **158.76 ~ 159.18 mm (6.250 ~ 6.267 in.)**
Service Limit: **161.1 mm (6.343 in.)**



Force [A]
1st Pin [C]
2nd Pin [D]
21th Pin [E]

Hi/Low Gears and Shift Mechanism

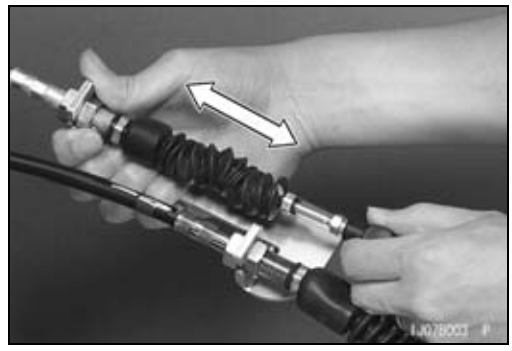
Hi/Low Shift Cable Installation

- Refer to the Transmission and Hi/Low Shift Cables Installation.

Hi/Low Shift Cable Inspection

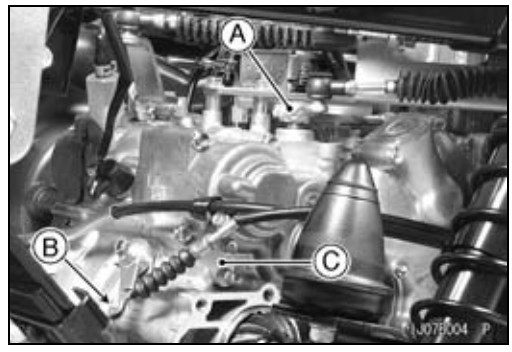
- With the cable disconnected at both ends, the cable should move freely within the cable housing.

★If the cable movement is not free, if the cable is frayed, or if the housing is kinked, replace the cable.

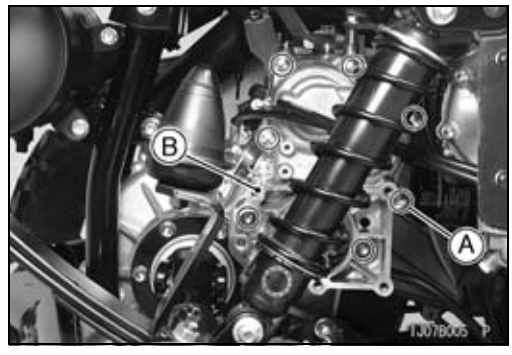


Hi/Low Gear and Shift Mechanism Removal

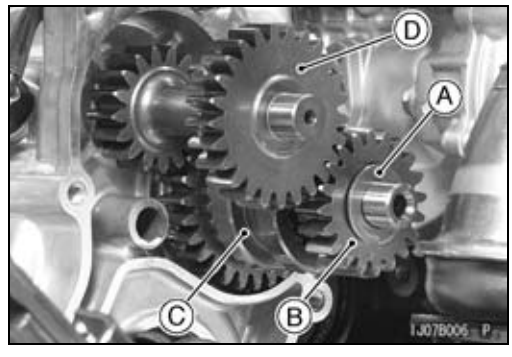
- Remove:
  Bevel Gear Case (see Bevel Gear Case Removal in the Final Drive chapter)
  Hi/Low Shift Shaft Lever [A]
  2WD/4WD Shift Cable Lower End [B]
  Cable Bracket [C]



- Remove:
  Hi/Low Gear Case Bolts [A]
  Hi/Low Gear Case [B]



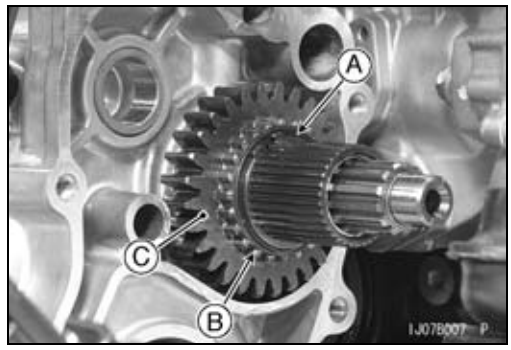
- Remove:
  Washer [A]
  High Gear [B]
  Washer
  Shifter [C]
  Reduction Gear [D]



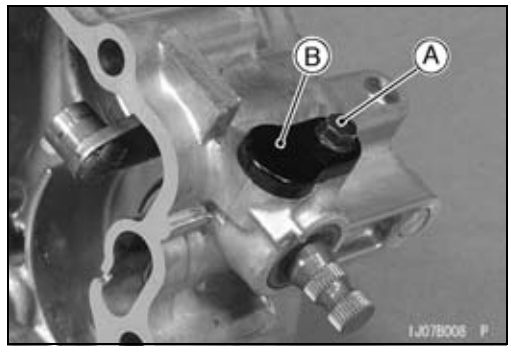
Hi/Low Gears and Shift Mechanism

● Remove:
Circlip [A]
Washer [B]
Low Gear [C]
Collar

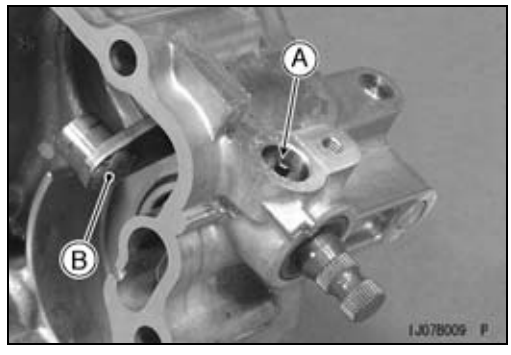
Special Tool - Outside Circlip Pliers: 57001-144



● Remove:
Bolt [A]
Holder [B]



● Remove:
Retaining Pin [A]
Shift Shaft and Arm [B]



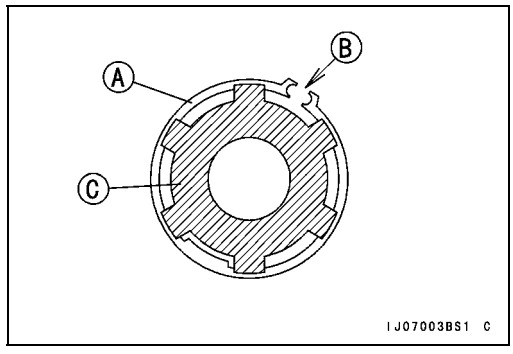
Hi/Low Gear and Shift Mechanism Installation

● Apply transmission oil to the following parts.
Hi/Low Gears
Shifter
● Apply grease to the oil seal lips.

● Replace the circlip that was removed with a new one.

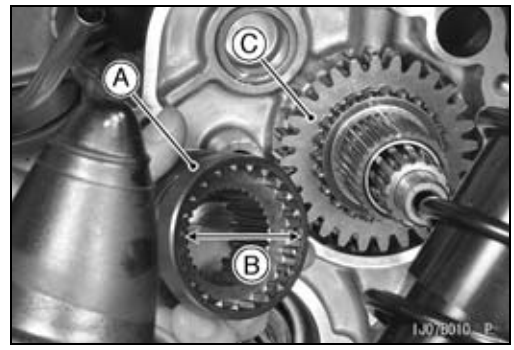
NOTE

○*Always install the circlip [A] so that the opening [B] is aligned with a spline groove. To install a circlip without damage, first fit the circlip onto the shaft [C] and then expand it just enough to install. Hence, use a suitable gear to push the circlip into place.*

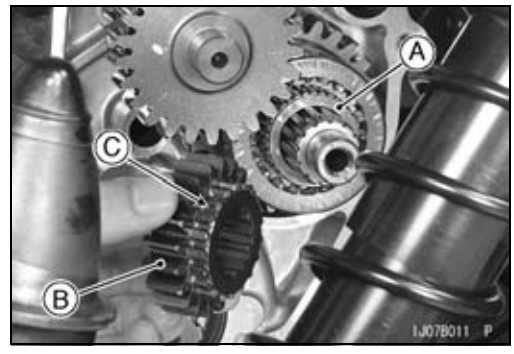


Hi/Low Gears and Shift Mechanism

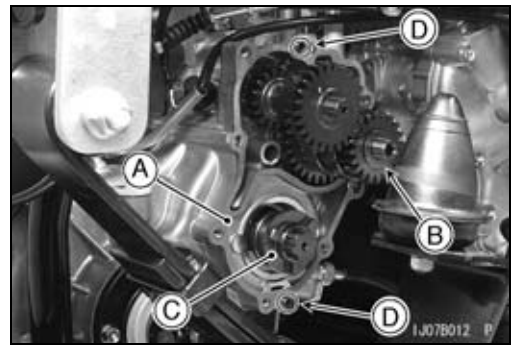
- Install the shifter [A] so that the large dogs [B] face to the low gear [C].



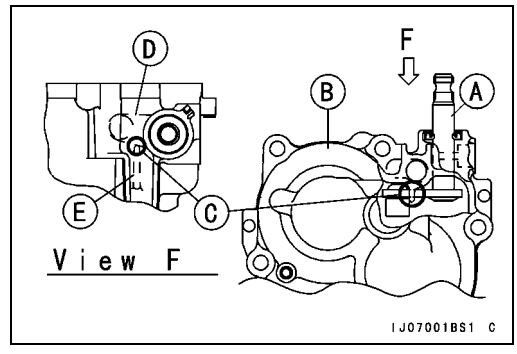
- Install:
  Reduction Gear
  Washer [A]
- Install the high gear [B] so that the small gear side [C] faces shifter side.



- Replace the hi/low gear case gasket [A] with a new one.
- Install:
  Washer [B]
  Shifter [C]
- Check to see that the hi/low gear case dowel pins [D] are in place on the transmission case.

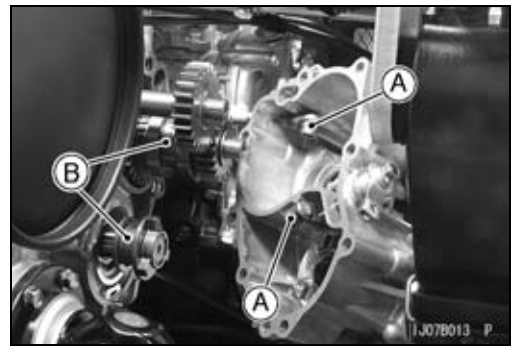


- Insert the shift shaft [A] in the gear case [B].
- Touch [C] the lever [D] of the shift shaft to lib [E].



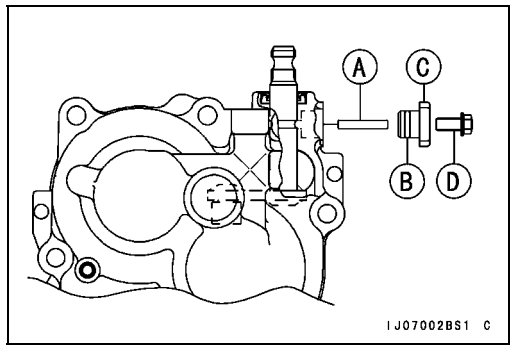
- Fit the shift arm pins [A] into the shifter grooves [B] and install the hi/low gear case.
- Tighten:

Torque - Hi/Low Gear Case Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)



Hi/Low Gears and Shift Mechanism

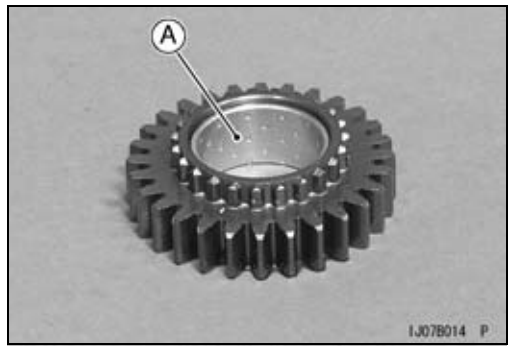
- Install the retaining pin [A].
- Apply grease to the O-ring [B] and install the holder [C].
- Tighten the bolt [D].
- Check that each gear and shifter spins or slides freely on its shaft without binding after assembly.



Hi/Low Gear and Shift Mechanism Inspection

- Visually inspect the hi/low gears, shifter, and low gear bushing [A].

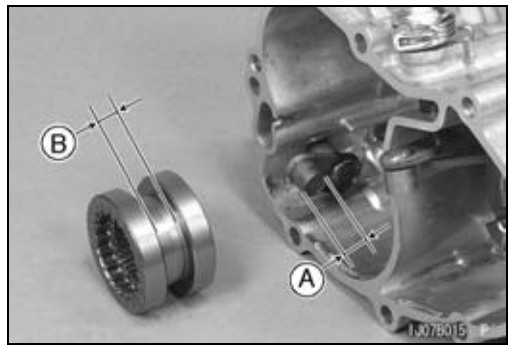
★If they are damaged or worn excessively, replace them.



- Replace parts worn beyond the service limit.

Shifter Block Outside Diameter [A]
Standard: 13.95 ~ 14.00 mm (0.549 ~ 0.551 in.)
Service Limit: 13.8 mm (0.543 in.)

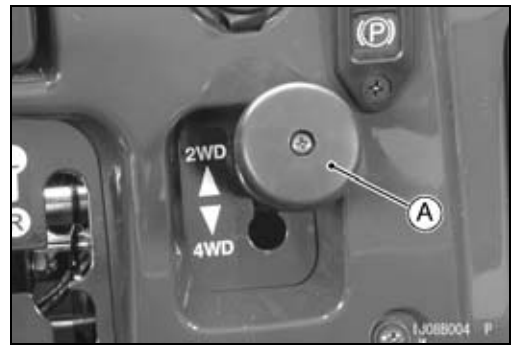
Shifter Groove Width [B]
Standard: 14.05 ~ 14.15 mm (0.553 ~ 0.557 in.)
Service Limit: 14.3 mm (0.563 in.)



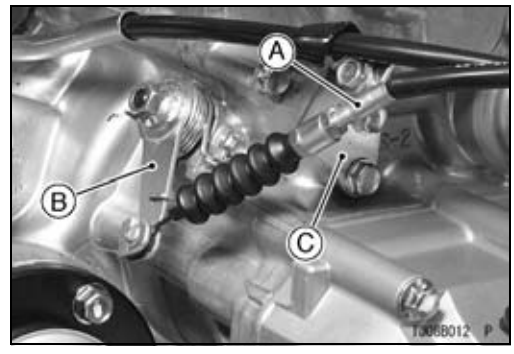
2WD/4WD Shift Mechanism

2WD/4WD Shift Cable Adjustment

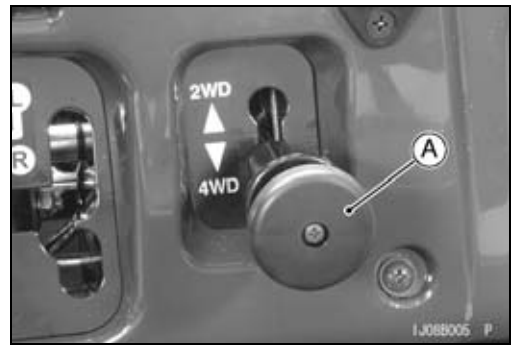
- Put the shift lever [A] in the 2WD position.



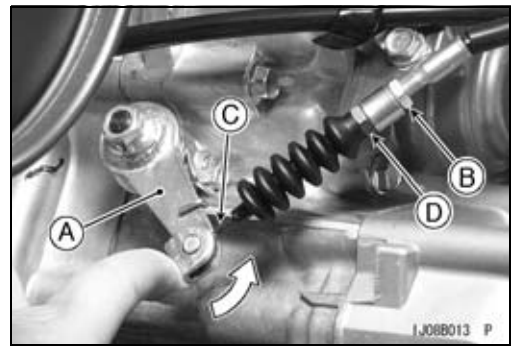
- Install the 2WD/4WD shift cable [A] to the shift shaft lever [B] and cable bracket [C].



- Put the shift lever [A] in the 4WD position.



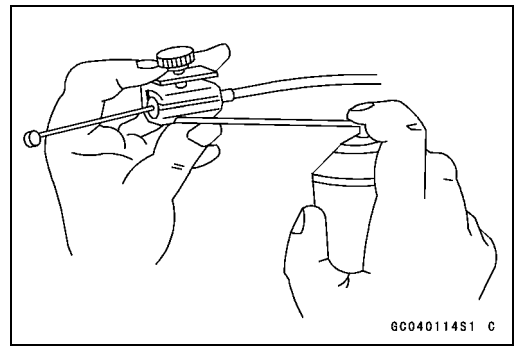
- Turn the shift shaft lever [A] counterclockwise until the lever is stopped by engaging the shifter with the drive bevel gear shaft.
- Screw in the upper adjuster nut [B] by hand until the inner cable [C] has no slack while holding the shift lever in the 4WD position.
- Tighten the lower adjuster nut [D] securely.



2WD/4WD Shift Cable Lubrication

Whenever the shift cable is removed, lubricate the cable as follows.

- Apply a thin coating of grease to the cable ends.
- Lubricate the cable with a penetrating rust inhibitor through the pressure cable luber.

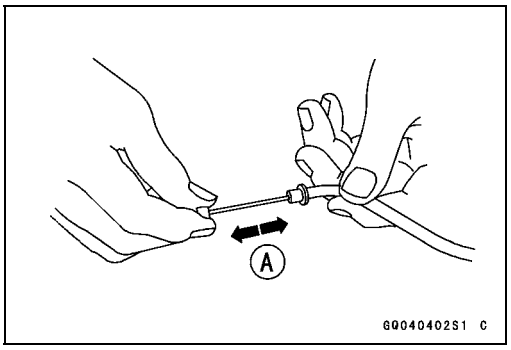


2WD/4WD Shift Mechanism

2WD/4WD Shift Cable Inspection

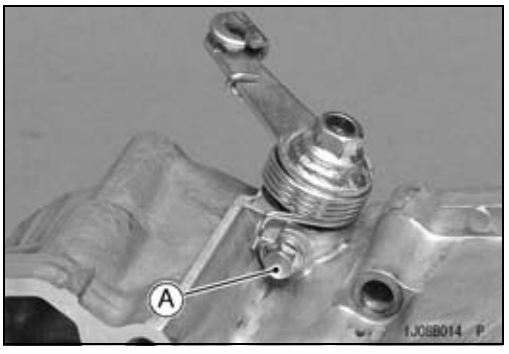
- With the cable disconnected at both ends, the cable should move freely [A] within the cable housing.

★If the cable movement is not free, if the cable is frayed, or if the housing is kinked, replace the cable.

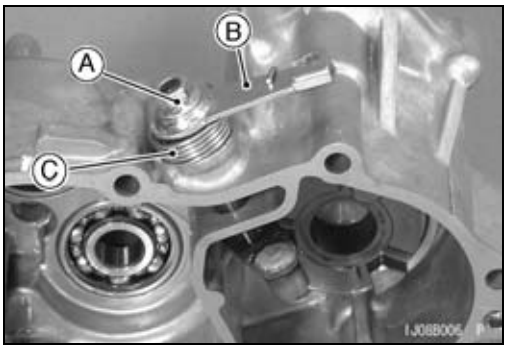


2WD/4WD Shift Mechanism Removal

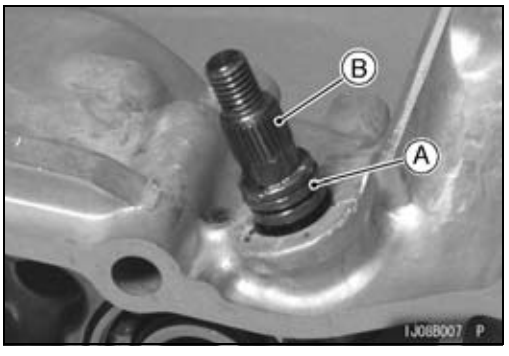
- Remove:
  Hi/Low Gear Case (see Hi/Low Gear and Shift Mechanism Removal)
  Shift Shaft Stop Bolt [A] and Washer



- Remove:
  Shift Shaft Lever Mounting Nut [A]
  Shift Shaft Lever [B]
  Spring [C]

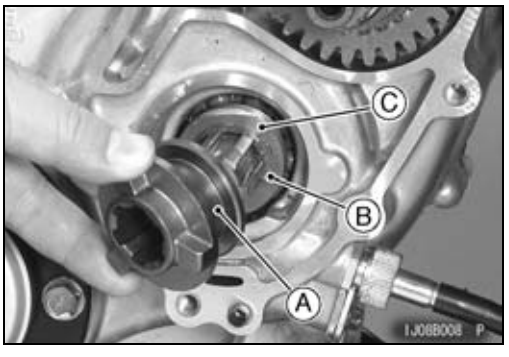


- Remove:
  O-ring [A]
  Shift Shaft [B]



- Remove:
  Shifter [A]
  Circlip [B]
  Speedometer Gear [C]
  Collar

Special Tool - Outside Circlip Pliers: 57001-144



2WD/4WD Shift Mechanism Installation

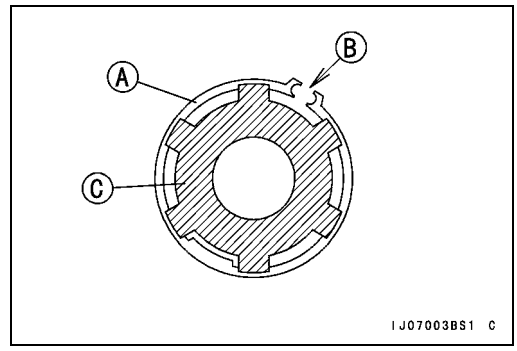
- Apply transmission oil to the following parts.
  Speedometer Gear
  Shifter

2WD/4WD Shift Mechanism

- Replace the circlip that was removed with a new one.

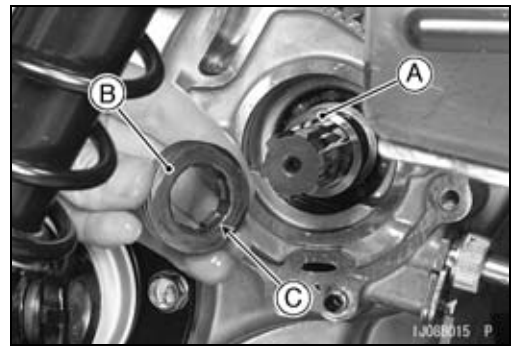
NOTE

○*Always install the circlip [A] so that the opening [B] is aligned with a spline groove. To install a circlip without damage, first fit the circlip onto the shaft [C] and then expand it just enough to install. Hence, use a suitable gear to push the circlip into place.*



- Install the collar [A].
- Install the speedometer gear [B] so that the stepped side [C] faces to the inside.
- Install the circlip.

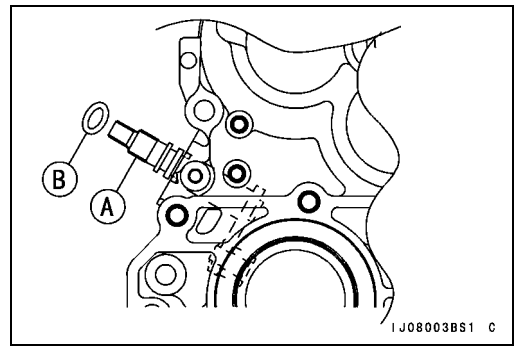
Special Tool - Outside Circlip Pliers: 57001-144



- Install the shifter so that the dogs [A] face to the outside.



- Insert the shift shaft [A] in the gear case.
- Install the O-ring [B] and apply molybdenum disulfide grease to the O-ring.



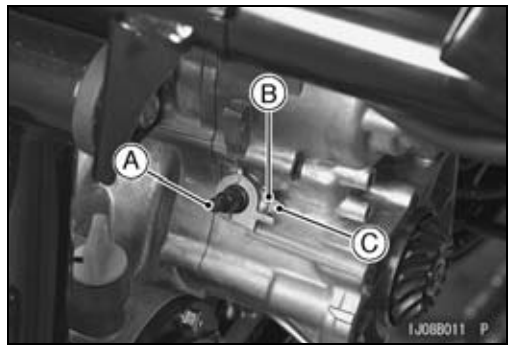
- When the hi/low gear case installing, refer to the Hi/Low Gear and Shift Mechanism Installation.

2WD/4WD Shift Mechanism

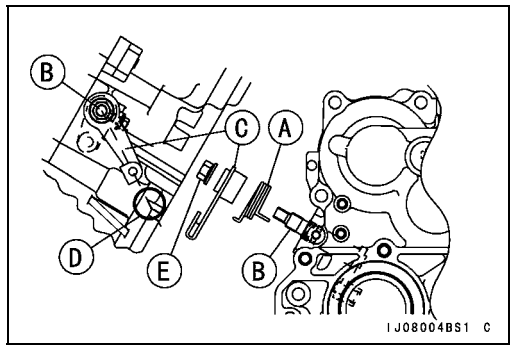
- Push the shift shaft [A] as shown in the figure.
- Install:
  Washer [B]
  Shift Shaft Stop Bolt [C]
- Tighten:

Torque - Shift Shaft Stop Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)

- Wipe off any protruding grease.



- Install the spring [A].
- Turn the shift shaft [B] counterclockwise until it is stop and hold it.
- Install the shift shaft lever [C] on the shift shaft so that the center of the lever hole with the mark [D] as shown in the figure.
- Tighten the shift shaft lever mounting nut [E].
- Hook the spring end.
- Check that each gear and shifter spins or slides freely on its shaft without binding after assembly.

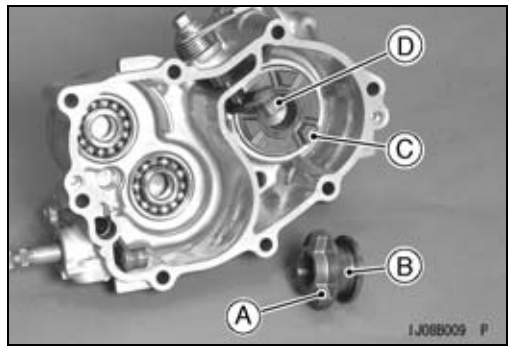


2WD/4WD Shift Mechanism Inspection

- Visually inspect the following parts.
  Dogs on Shifter [A]
  Shifter Groove [B]
  Dogs on Drive Bevel Gear Shaft [C]
  Shifter Block [D]

★If they are damaged or worn excessively, replace them.

- Replace parts worn beyond the service limit.



Shifter Block Outside Diameter

Standard:	**13.95 ~ 14.00 mm (0.549 ~ 0.551 in.)**
Service Limit:	**13.8 mm (0.543 in.)**

Shifter Groove Width

Standard:	**14.0 ~ 14.2 mm (0.551 ~ 0.559 in.)**
Service Limit:	**14.3 mm (0.563 in.)**

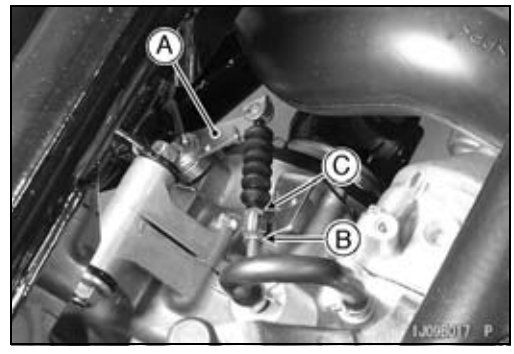
Differential Gears and Shift Mechanism

Differential Shift Cable Adjustment

● Put the shift lever [A] in the UNLOCK position.



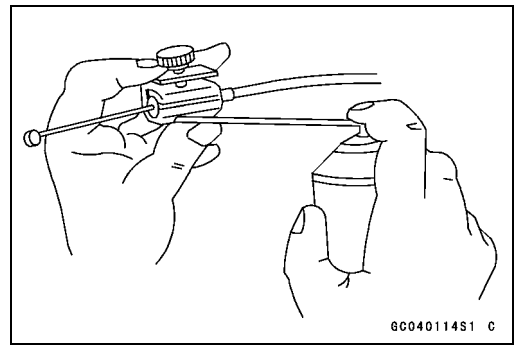
● Set the shift shaft lever [A] in the UNLOCK position.
● Loosen the adjuster nut [B] until the inner cable is slightly loosened.
● Tighten the adjuster nut [C] securely.



Differential Shift Cable Lubrication

Whenever the shift cable is removed, lubricate the cable as follows.

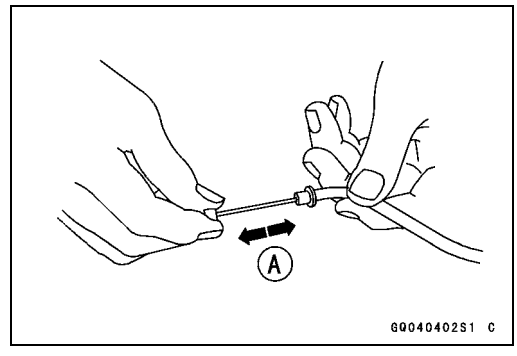
● Apply a thin coating of grease to the cable ends.
● Lubricate the cable with a penetrating rust inhibitor through the pressure cable luber.



Differential Shift Cable Inspection

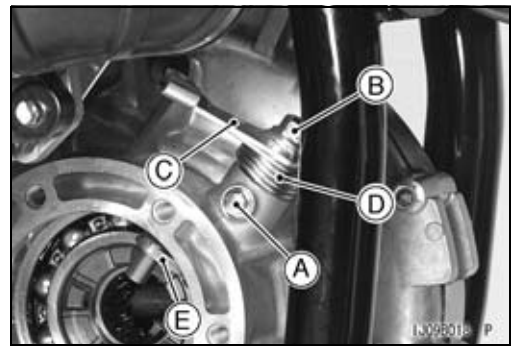
● With the cable disconnected at both ends, the cable should move freely [A] within the cable housing.

★If the cable movement is not free, if the cable is frayed, or if the housing is kinked, replace the cable.



Differential Shift Mechanism Removal

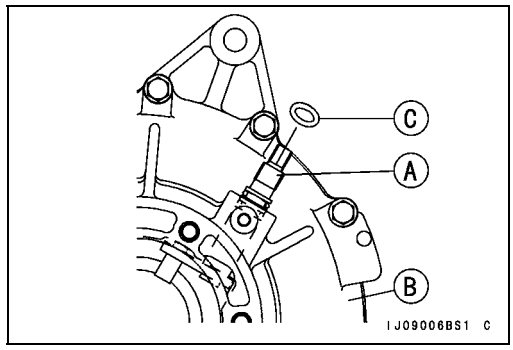
● Remove:
Drive Shafts and Axles (see Rear Drive Shaft and Axle Removal in the Final Drive chapter)
Shift Shaft Stop Bolt [A]
Shift Shaft Lever Mounting Nut [B]
Shift Shaft Lever [C]
Spring [D]
Shift Shaft and Arm [E]



Differential Gears and Shift Mechanism

Differential Shift Mechanism Installation

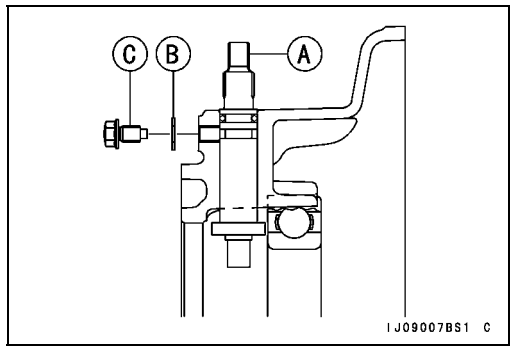
- Insert the shift shaft [A] in the gear case [B].
- Install the O-ring [C] and apply molybdenum disulfide grease to the O-ring.



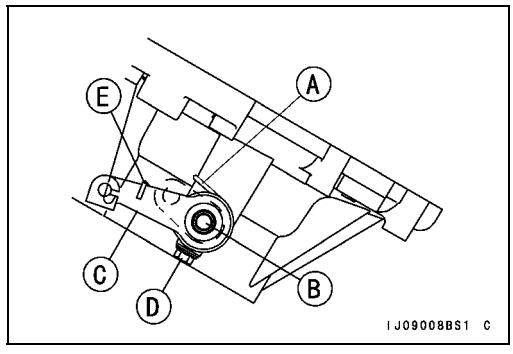
- Push the shift shaft [A] as shown in the figure.
- Install:
  Washer [B]
  Shift Shaft Stop Bolt [C]
- Tighten:

Torque - Shift Shaft Stop Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)

- Wipe off any protruding grease.

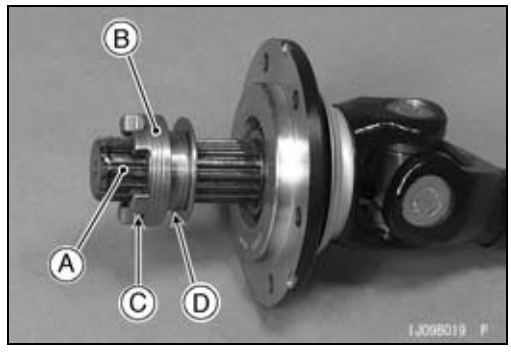


- Install the spring [A].
- Turn the shift shaft [B] clockwise until stop and hold it.
- Install the shift shaft lever [C] on the shift shaft so that the lever is position like the figure.
- Tighten the shift shaft lever mounting nut [D].
- Hook the spring end [E] as shown in the figure.



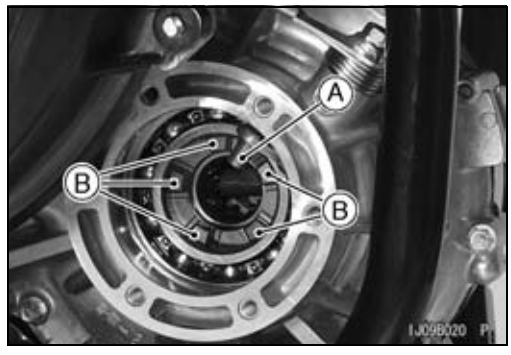
Differential Shift Mechanism Inspection

- Visually inspect the following parts.
  Splines on Drive Shaft [A]
  Splines on Shifter [B]
  Dogs [C] on Shifter
  Shifter Groove [D]



- Visually inspect the following parts
  Shift Arm Pin [A]
  Dogs [B] on Differential Gear Housing

★If they are damaged or worn excessively, replace them.

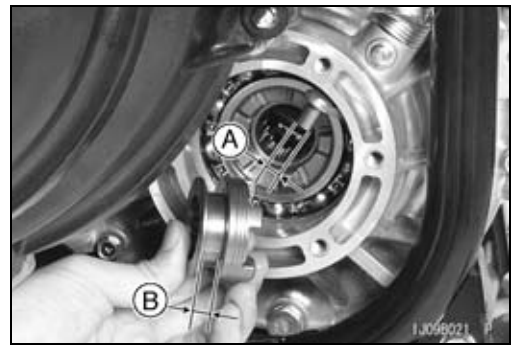


Differential Gears and Shift Mechanism

- Replace parts worn beyond the service limit.

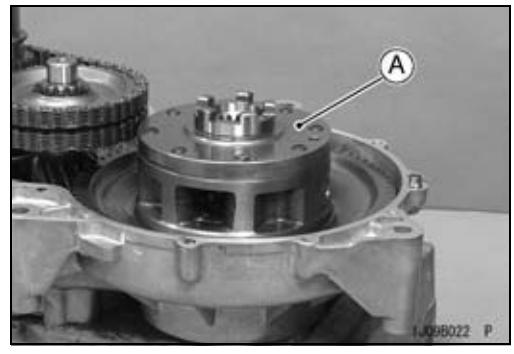
Shift Arm Pin Diameter [A]
Standard: 8.4 ~ 8.6 mm (0.331 ~ 0.339 in.)
Service Limit: 8.3 mm (0.327 in.)

Shifter Groove Width [B]
Standard: 9.0 ~ 9.1 mm (0.354 ~ 0.358 in.)
Service Limit: 9.2 mm (0.362 in.)

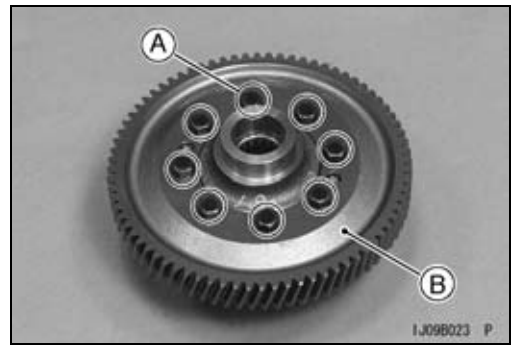


Differential Gear Removal

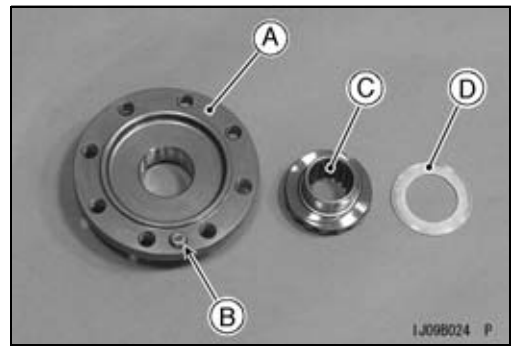
- Split the transmission gear case (see Transmission Gear Case Splitting).
- Remove the differential gear [A].



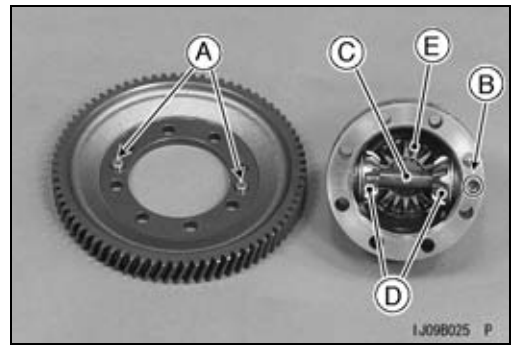
- Remove:
  Differential Gear Housing Bolts [A]
  Final Gear [B]



- Remove:
  Housing Cover [A]
  Dowel Pin [B]
  Side Gear [C]
  Spacer [D]



- Remove:
  Dowel Pins [A]
  Retaining Pin [B]
  Pinion Gear Shaft [C]
  Pinion Gears [D]
  Spacers
  Side Gear [E]
  Spacer



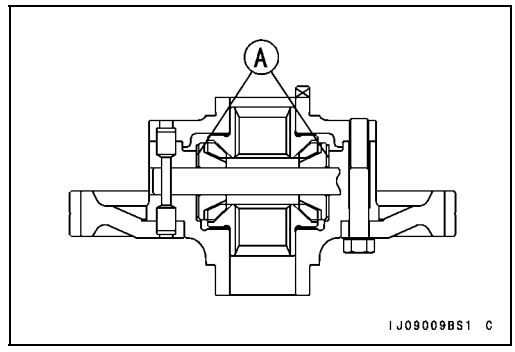
Differential Gears and Shift Mechanism

Differential Gear Installation

- Apply transmission oil to the following parts.
  Side Gears
  Pinion Gears
- Apply a non-permanent locking agent to the threads of the differential gear housing bolts and tighten them.

Torque - Differential Gear Housing Bolts: 57 N·m (5.8 kgf·m, 42 ft·lb)

★If the backlash of the differential gears cannot keep, replace the spacers [A] to thinner spacers.



Spacers

Thickness	Part Number
1.2 mm (0.047 in.)	92200-0021
1.0 mm (0.039 in.)	92200-1044

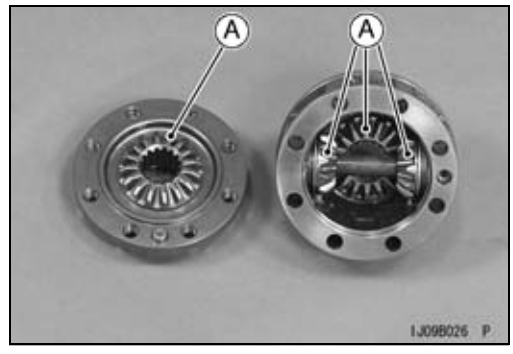
NOTE

○*Use the spacers of the same thickness as a set.*
○*Do not use the spacers of 1.2 mm (0.047 in.) and 1.0 mm (0.039 in.) thickness at the same time.*

Differential Gear Inspection

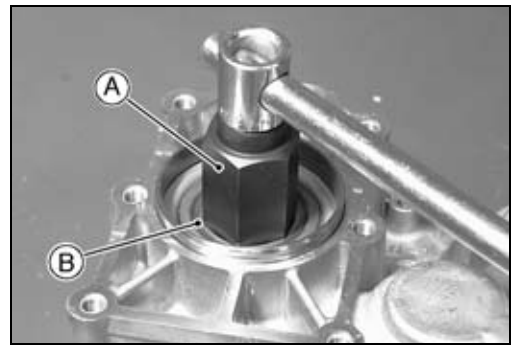
- Visually inspect the differential gears [A].

★Replace the gears as a set if either gear is damaged.



Bearings and Oil Seal

Bearing Replacement

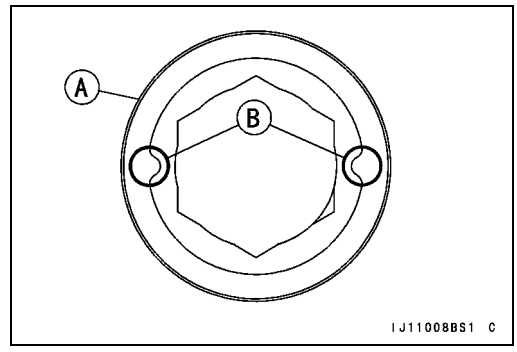


- Using a press, a puller, the oil seal & bearing remover, or the bearing driver set, remove the bearings.

  Special Tools - Oil Seal & Bearing Remover: 57001-1058
  Bearing Driver Set: 57001-1129

- Using the hexagon wrench [A], remove the bearing holder [B] and remove the drive bevel gear shaft bearing.

  Special Tool - Hexagon Wrench, Hex 32: 57001-1194



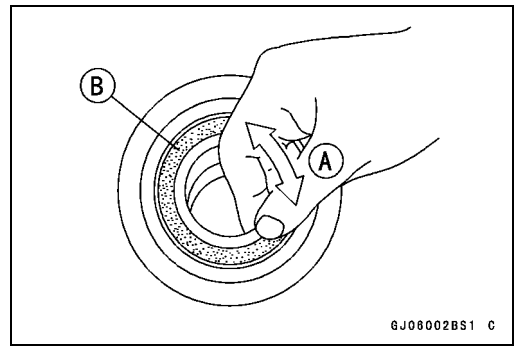
- Apply molybdenum disulfide oil solution to the threads of the drive bevel gear shaft bearing holder [A].
- Install the bearing holder so that the projections [B] face to outside.
- Tighten:

  Torque - Bearing Holder: 118 N·m (12.0 kgf·m, 87.0 ft·lb)

- Using a press and the bearing driver set, install the new bearings and/or new oil seals.

  Special Tool - Bearing Driver Set: 57001-1129

Ball Bearing Inspection



- Turn each bearing back and forth [A] while checking for roughness or binding.

★If roughness or binding is found, replace the bearing.

- Examine the bearing seal [B] for tears or leakage.

★If the seal is torn or is leaking, replace the bearing.

Needle Bearing Inspection

- Check the needle bearing.

○The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.

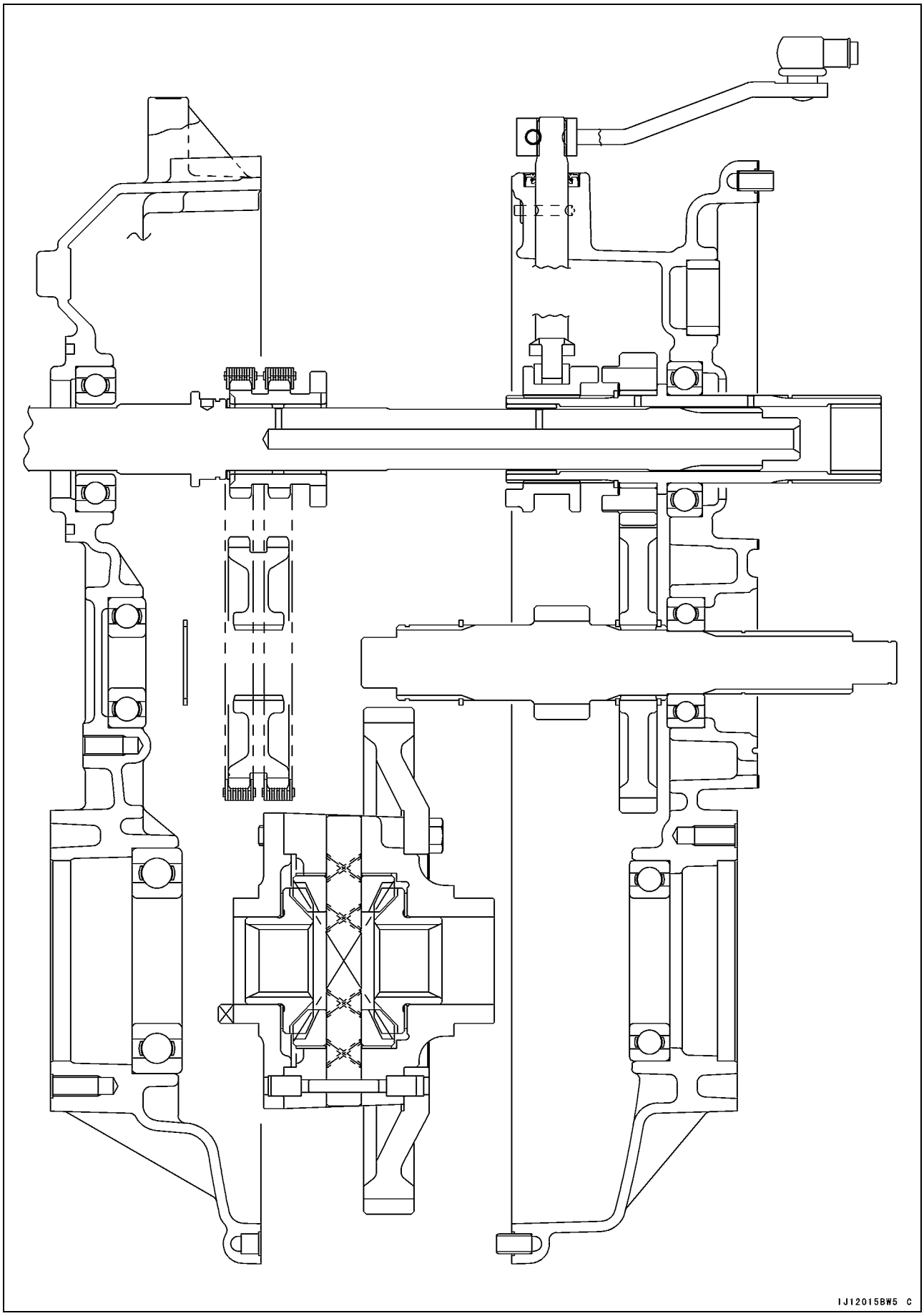
★If there is any doubt as to the condition of a needle bearing, replace it.

Oil Seal Inspection

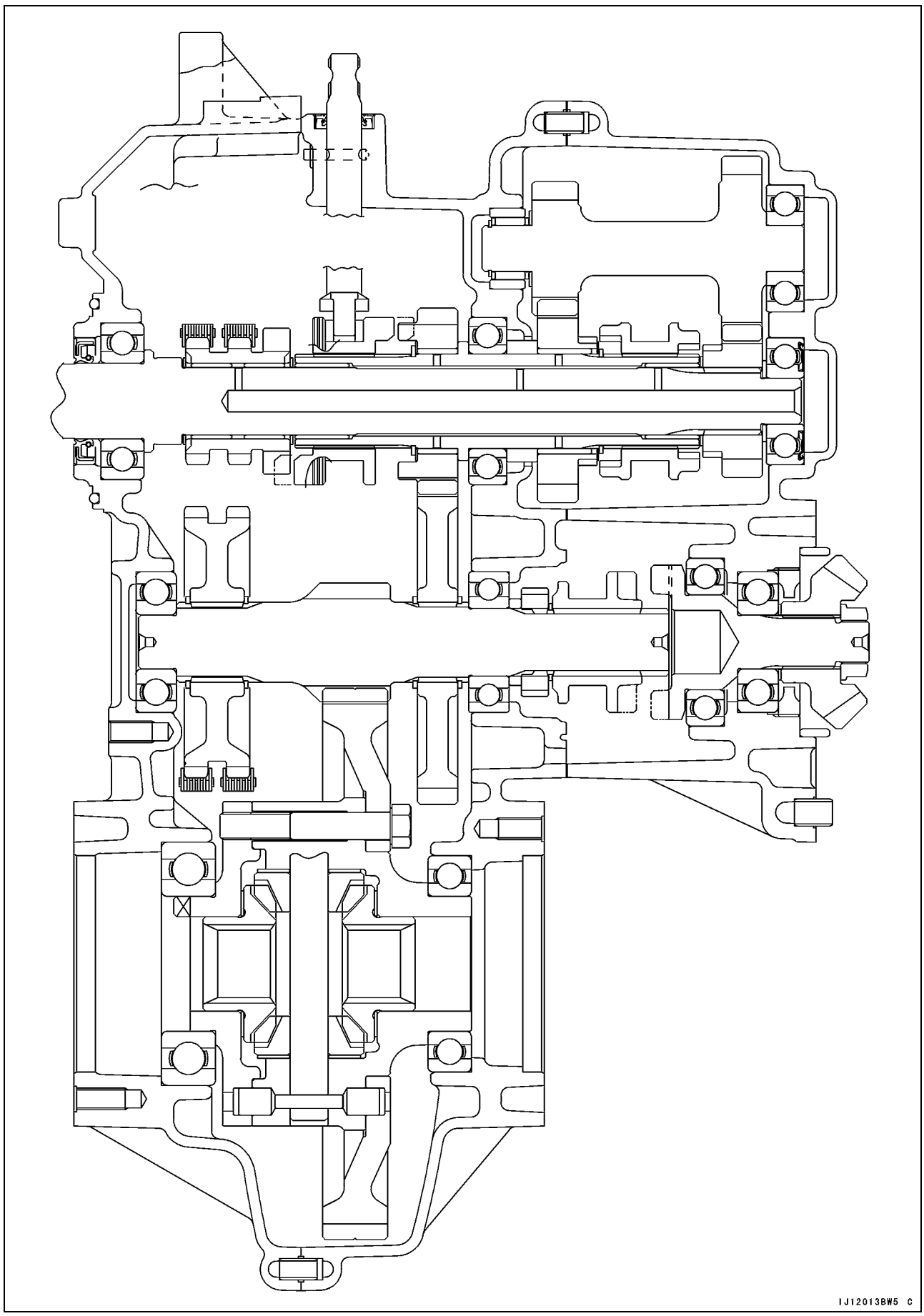
- Visually inspect the oil seal.

★Replace it if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened, or been otherwise damaged.

Transmission Sectional Figure



Transmission Sectional Figure

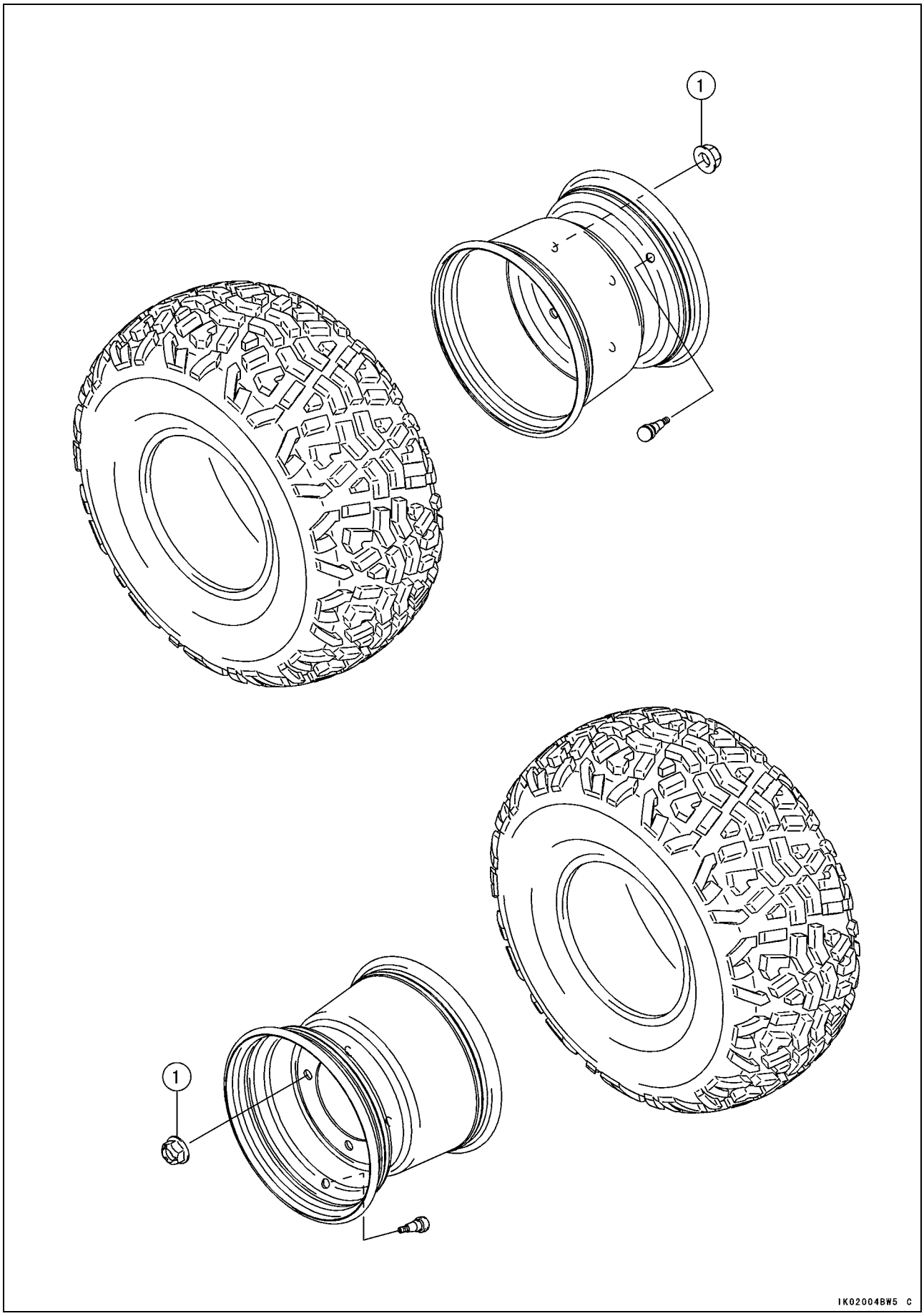


Wheels/Tires

Table of Contents

Exploded View 11-2
Specifications 11-4
Wheel Alignment 11-5
    Toe-in Adjustment 11-5
Wheels (Rims) 11-7
    Wheel Removal 11-7
    Wheel Installation 11-7
    Wheel (Rim) Inspection 11-7
    Wheel (Rim) Replacement 11-7
Tires 11-9
    Tire Removal 11-9
    Tire Installation 11-9
    Tire Inspection 11-10

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Wheel Nuts	137	14.0	101	

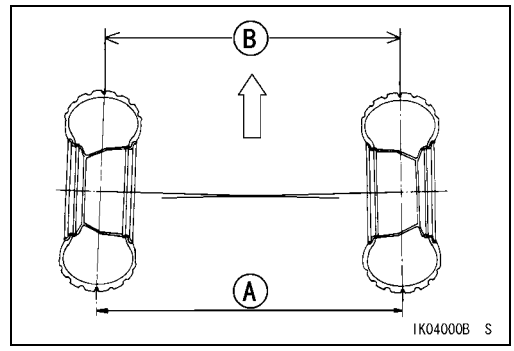
Specifications

Item	Standard	Service Limit
Wheel Alignment		
Caster	7.5° (non-adjustable)	– – –
Camber	0.8° (non-adjustable)	– – –
Toe-in	0 ~ 20 mm (0 ~ 0.79 in.) at 1G	– – –
Wheels (Rims)		
Rim Size:		
Front and Rear	10 × 8.5	– – –
Tires		
Standard Tire:		
Front and Rear	23 × 11.00-10	– – –
	DUNLOP KT869, Tubeless	– – –
Tire Air Pressure (when Cold):		
Front	69 kPa (0.70 kgf/cm², 10 psi)	– – –
Rear	167 kPa (1.7 kgf/cm², 24 psi)	– – –
Maximum Tire Air Pressure (to seat beads, when cold)	250 kPa (2.5 kgf/cm², 36 psi)	– – –
Tire Tread Depth	13.2 mm (0.52 in.)	3 mm (0.12 in.)

Wheel Alignment

Toe-in is the amount that the front wheels are closer together in front than at the rear at the axle height. When there is toe-in, the distance **A** (rear) is greater than **B** (front) as shown in the figure. The purpose of toe-in is to prevent the front wheels from getting out of parallel at any time, and to prevent any slipping or scuffing action between the tires and the ground. If toe-in is incorrect, the front wheels will be dragged along the ground, scuffing and wearing the tread knobs.

Caster and camber are built-in and require no adjustment.

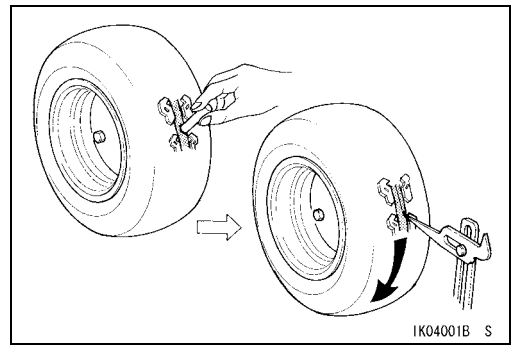


A (Rear) - B (Front) = Amount of Toe-in

(Distance A and B are measured at hub height)

Toe-in Adjustment

- Lift the front wheels off the ground.
- Apply a heavy coat of chalk near the center of the front tires.
- Using a needle nose scriber, make a thin mark near the center of the chalk coating while turning the wheel.
- Set the wheels so that the marks on the tires are at the front side and at the level of the axle height.
- Ground the front wheels.
- Set the steering wheel straight ahead.
- At the level of the axle height, measure the distance between the scribed lines with a measure.
- Move the vehicle rearward until the marks on the front tires are at the rear side and at the same level as the axle.
- Measure the distance between the scribed lines.
- Subtract the measurement of the front from the measurement of the rear to get the toe-in.



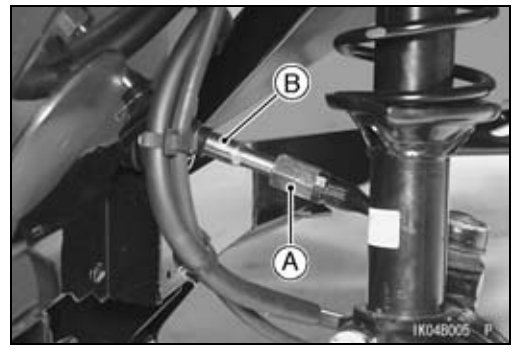


Toe-in of Front Wheels

Standard: 0 ~ 20 mm (0 ~ 0.79 in.) at 1G

★If the toe-in is not the specified value, perform the following procedure.

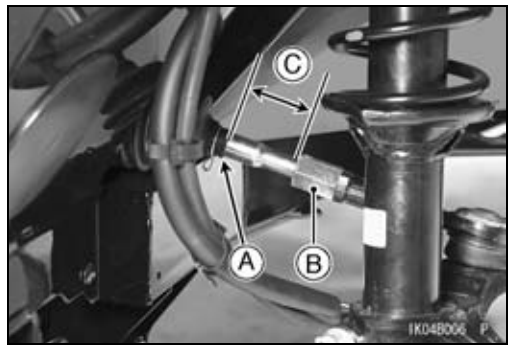
- Loosen the locknuts [A] on each tie-rod and turn the adjusting rods [B] the same number of turns and the same direction on both sides to achieve the specified toe-in.



Wheel Alignment

NOTE

○*The toe-in will be near the specified range, if the length of the tie-rod distance between the dust boot end [A] of steering gear assembly and the locknut [B] is 43.5 mm (1.71 in.) [C] on both the left and right tie-rods.*



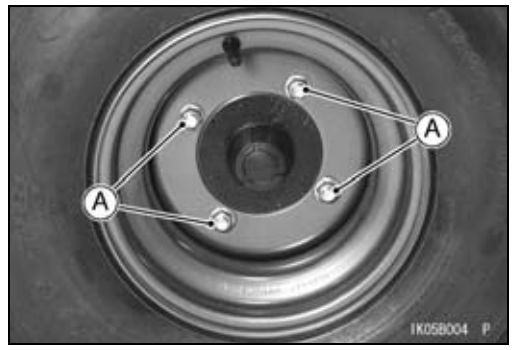
- Tighten:

Torque - Tie-Rod End Locknuts: 49 N·m (5.0 kgf·m, 36 ft·lb)

- Check the toe-in again.
- Test drive the vehicle.

Wheels (Rims)

Wheel Removal



- Loosen the wheel nuts [A].

○Do not remove the wheel nuts.

- Lift the wheel(s) off the ground.
- Remove:

  Wheel Nuts

  Wheel(s)

Wheel Installation

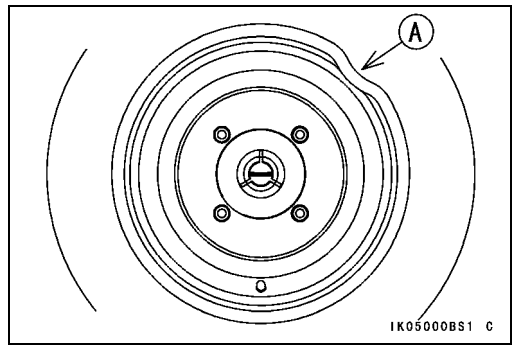


- Position the wheel so that the valve stem [A] is toward the outside of the vehicle.
- Tighten:

Torque - Wheel Nuts: 137 N·m (14.0 kgf·m, 101 ft·lb)

○Tighten the wheel nuts in a criss-cross pattern.

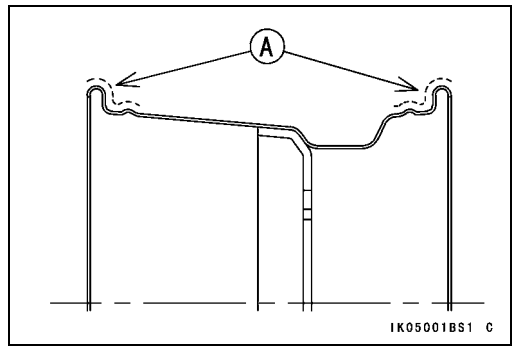
Wheel (Rim) Inspection



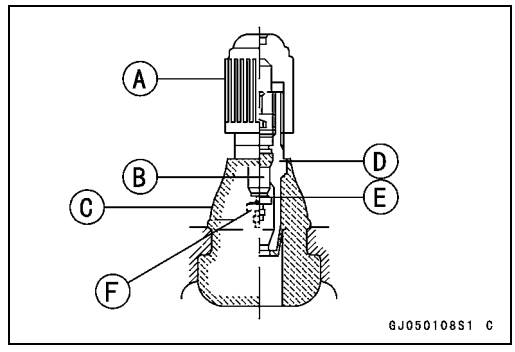
- Examine both sides of the rim for dents [A].

★If the rim is dented, replace it.

★If the tire is removed, inspect the air sealing surfaces [A] of the rim for scratches or nicks. Smooth the sealing surfaces with fine emery cloth if necessary.



Wheel (Rim) Replacement



- Remove the wheel (see Wheel Removal).
- Disassemble the tire from the rim.
- Remove the valve stem and discard it.

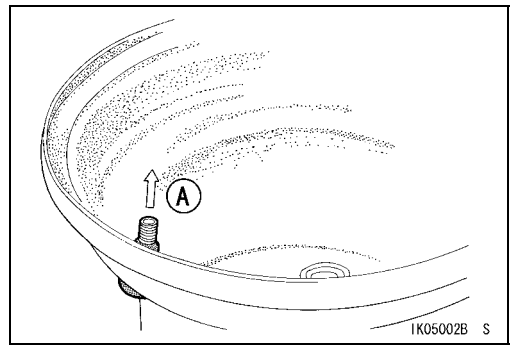
CAUTION
Replace the air valve whenever the tire is replaced. Do not reuse the air valve.

Plastic Cap [A]
Valve Core [B]
Stem Seal [C]
Valve Stem [D]
Valve Seat [E]
Valve Opened [F]

Wheels (Rims)

● Install a new air valve in the new rim.

○Remove the valve cap, lubricate the stem with a soap and water solution, and pull [A] the stem through the rim from the inside out until it snaps into place.



CAUTION

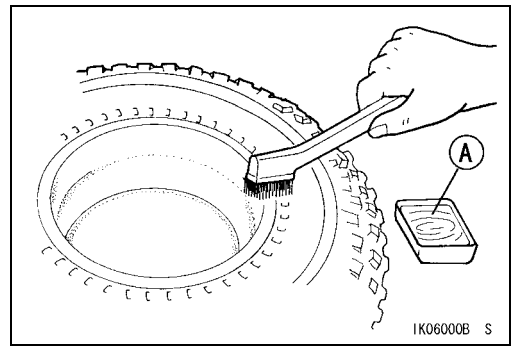
Do not use engine oil or petroleum distillates to lubricate the stem because they will deteriorate the rubber.

● Mount the tire on the new rim.

● Install the wheel (see Wheel Installation).

Tires

Tire Removal



- Remove:
  Wheel (see Wheel Removal)
  Valve Core (Let out the air)
- Lubricate the tire beads and rim flanges on both sides of the wheel with a soap and water solution, or water [A]. This helps the tire beads slip off the rim flanges.

CAUTION

Do not lubricate the tire beads and rim flanges with engine oil or petroleum distillates because they will deteriorate the tire.

- Remove the tire from the rim using a suitable commercially available tire changer.

NOTE

○*The tires cannot be removed with hand tools because they fit the rims tightly.*

Tire Installation

- Inspect the rim.
- Check the tire for wear and damage.
- Replace the air valve with a new one.

CAUTION

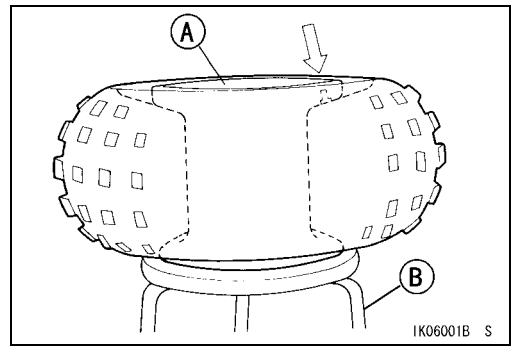
Replace the air valve whenever the tire is replaced. Do not reuse the air valve.

- Lubricate the tire beads and rim flanges with a soap and water solution, or water.

⚠ WARNING

Do not use any lubricant other than a water and soap solution, or water to lubricate the tire beads and rim because it may cause tire separation, and a hazardous condition may result.

- Install the tire on the rim using a suitable commercially available tire changer.
- Lubricate the tire beads again and center the tire on the rim.



- Support the wheel rim [A] on a suitable stand [B] to prevent the tire from slipping off.
- Inflate the tire until the tire beads seat on the rim.

Maximum Tire Air Pressure (to seat beads, when cold)
Front and Rear: 250 kPa (2.5 kgf/cm², 36 psi)

⚠ WARNING

Do not inflate the tire to more than the maximum tire air pressure. Overinflation can explode the tire with possibility of injury and loss of life.

Tires

- Check to see that the rim lines [A] on both sides of the tire are parallel with the rim flanges [B].

★If the rim lines and the rim flanges are not parallel, deflate the tire, lubricate the sealing surfaces again, and reinflate the tire.

- After the beads are properly seated, check for air leaks.

○Apply a soap and water solution around the tire bead and check for bubbles.

- Check the tire pressure using an air pressure gauge.

Tire Air Pressure (when Cold)

Front:	**69 kPa (0.70 kgf/cm², 10 psi)**
Rear:	**167 kPa (1.7 kgf/cm², 24 psi)**

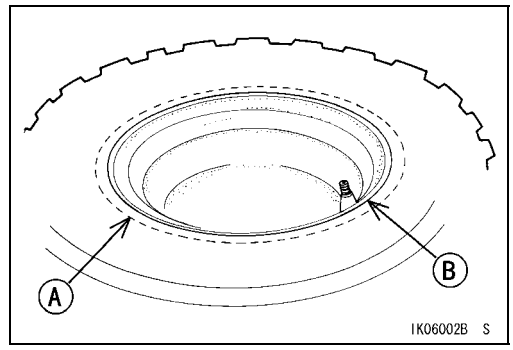
- Install the wheel (see Wheel Installation).
- Wipe off the soap and water solution, or water on the tire, and dry the tire before operation.

⚠ WARNING

Do not operate the vehicle with the water and soap, or water still around the tire beads. They will cause tire separation, and a hazardous condition may result.

Tire Inspection

- Refer to the Tire Wear Inspection in the Periodic Maintenance chapter.



Final Drive

Table of Contents

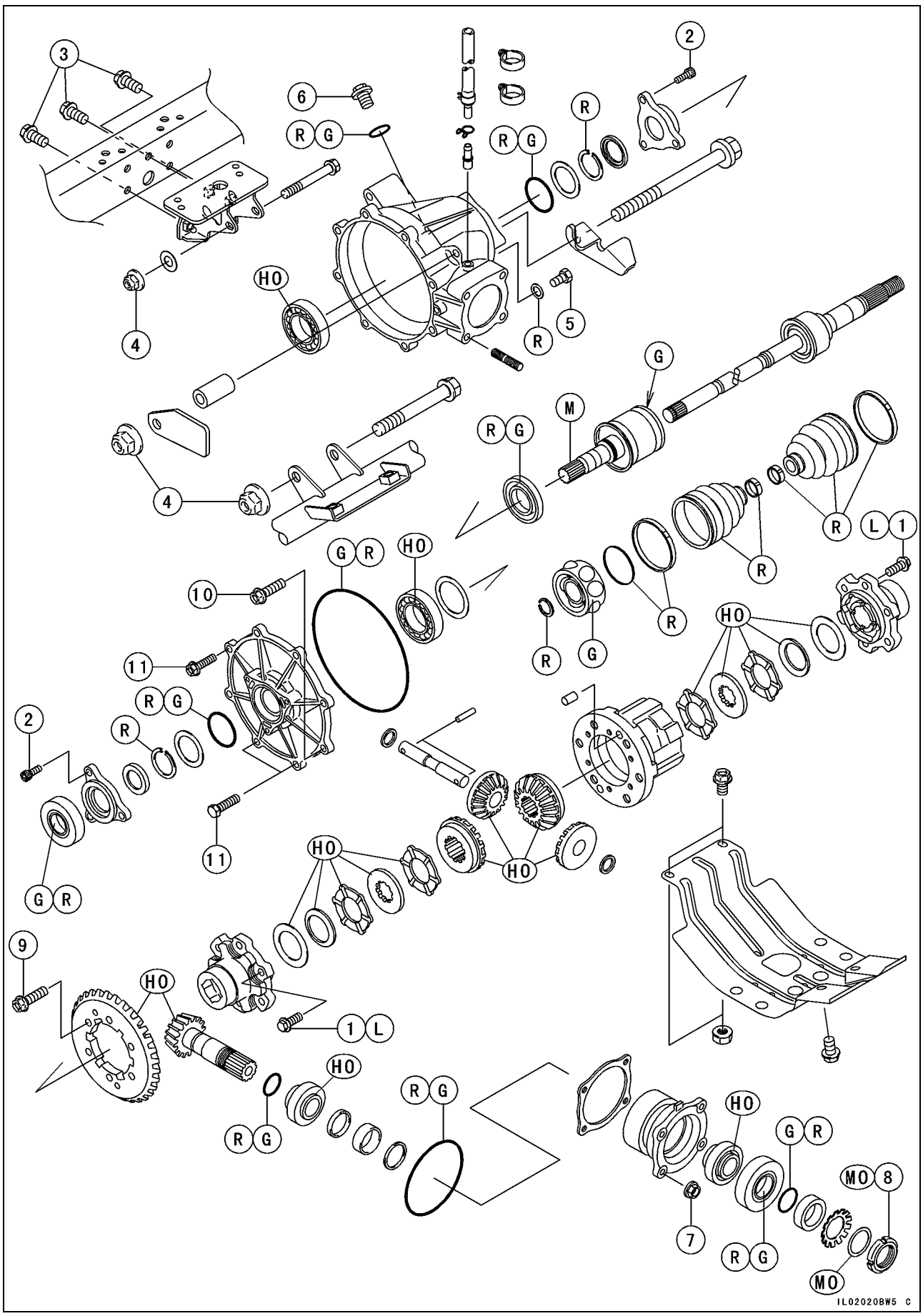
Exploded View 12-2
Specifications 12-6
Special Tools 12-7
Front Final Gear Case 12-8
- Front Final Gear Case Oil Level Inspection 12-8
- Front Final Gear Case Oil Change 12-8
- Front Final Gear Case Removal .. 12-9
- Front Final Gear Case Installation 12-9
- Front Final Gear Case Disassembly 12-10
- Front Final Gear Case Assembly. 12-10
- Differential Unit and Ring Gear Disassembly 12-11
- Differential Unit and Ring Gear Assembly 12-11
- LSD Clutch Torque Inspection 12-12
- LSD Clutch Plate Inspection 12-13
- Pinion Gear Unit Disassembly 12-13
- Pinion Gear Unit Assembly 12-13
- Front Final Bevel Gear Adjustment 12-14
- Backlash Adjustment 12-17
- Tooth Contact Adjustment 12-18
- Bevel Gear Inspection 12-20
- Differential Gear Inspection 12-20
- Tapered Roller Bearing Inspection 12-20
- Ball Bearing Inspection 12-20
- Oil Seal Inspection 12-20

Bevel Gear Case 12-21
- Bevel Gear Case Removal 12-21
- Bevel Gear Case Installation 12-21
- Bevel Gear Case Disassembly 12-21
- Bevel Gear Case Assembly 12-22
- Drive Bevel Gear Removal 12-23
- Drive Bevel Gear Installation 12-23
- Bevel Gear Adjustment 12-24
- Backlash Adjustment 12-24
- Tooth Contact Adjustment 12-26
- Bevel Gear Inspection 12-28
- Ball Bearing Inspection 12-28
- Oil Seal Inspection 12-28
- Damper Inspection 12-28

Propeller Shafts 12-29
- Propeller Shaft Removal 12-29
- Propeller Shaft Installation 12-30
- Propeller Shaft Bearing Housing Removal 12-31
- Propeller Shaft Bearing Housing Installation 12-31
- Propeller Shaft Inspection 12-32

Drive Shaft and Axles 12-33
- Front Axle Removal 12-33
- Front Axle Installation 12-33
- Rear Drive Shaft and Axle Removal 12-33
- Rear Drive Shaft and Axle Installation 12-34
- Drive Shaft and Axle Inspection... 12-34
- Dust Boot Inspection 12-35
- Front Axle Joint Boot Replacement 12-35
- Ball Bearing Inspection 12-39
- Grease Seal Inspection 12-40

Exploded View

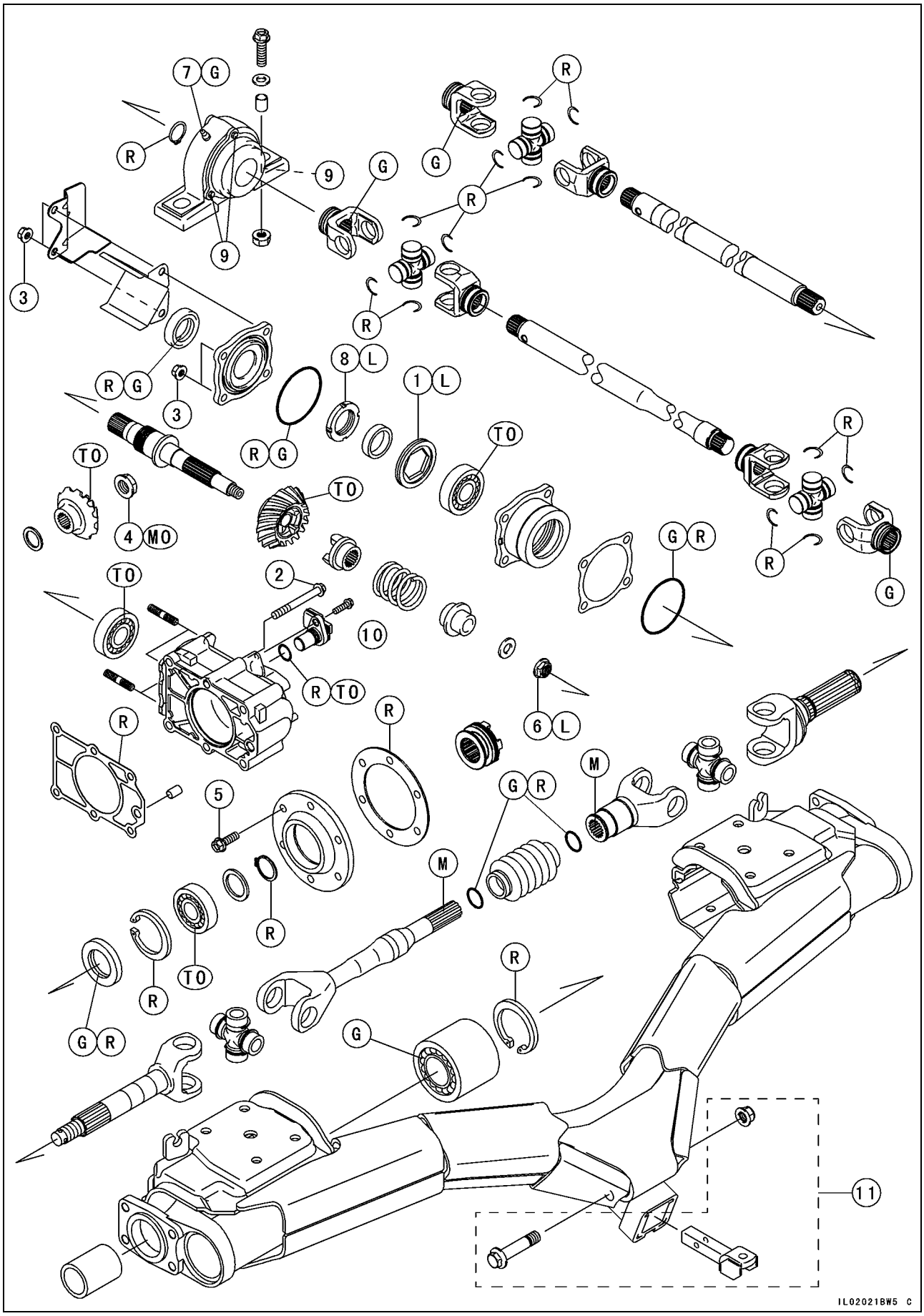


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Differential Case Torx Bolts	32	3.3	24	L
2	Front Axle Cap Bolts	8.8	0.90	78 in·lb	
3	Gear Case Bracket Bolts	44	4.5	32	
4	Gear Case Mounting Nuts	44	4.5	32	
5	Oil Drain Plug	20	2.0	15	
6	Oil Filler Cap	29	3.0	21	
7	Pinion Gear Bearing Housing Nuts	25	2.5	18	
8	Pinion Gear Slotted Nut	118	12.0	87.0	MO
9	Ring Gear Bolts	49	5.0	36	
10	Ring Gear Cover Bolts (M10)	47	4.8	35	
11	Ring Gear Cover Bolts (M8)	25	2.5	18	

G: Apply grease.
HO: Apply hypoid gear oil.
L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
R: Replacement Parts

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Bearing Holder	118	12.0	87.0	L
2	Bevel Gear Case Bolts	22	2.2	16	
3	Bevel Gear Case Holder Nuts	25	2.5	18	
4	Drive Gear Nut	118	12.0	87.0	MO
5	Drive Shaft Cap Bolts	20	2.0	15	
6	Driven Gear Shaft Nut	108	11.0	79.7	L
7	Grease Nipple	2.3	0.23	20 in·lb	G
8	Housing Locknut	118	12.0	87.0	L
9	Propeller Shaft Bearing Housing Cover Bolts	3.4	0.35	30 in·lb	
10	Speed Sensor Bolt	8.8	0.90	78 in·lb	

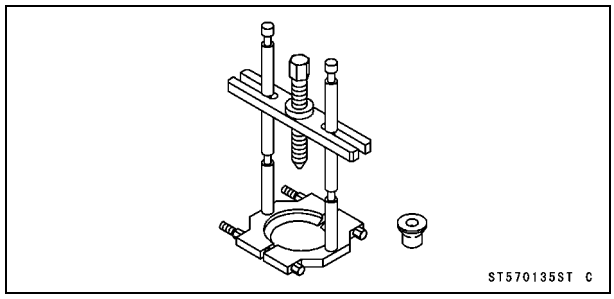
11. EUR Model
G: Apply grease.
L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
R: Replacement Parts
TO: Apply transmission oil.

Specifications

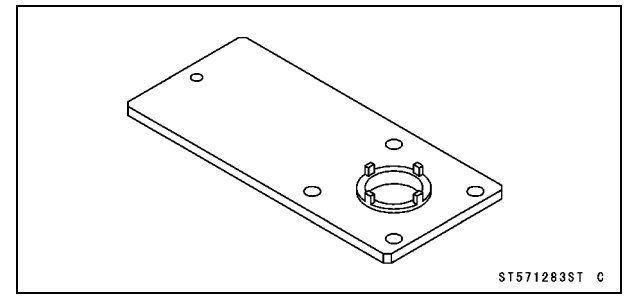
Item	Standard	Service Limit
Front Final Gear Case		
Gear Case Oil:		
Type	Hypoid gear oil for LSD (Limited Slip Differential gears)	– – –
Viscosity	SAE 140 (GL-5) or SAE 90 (GL-6)	– – –
Capacity	0.4 L (0.4 US qt)	– – –
Oil Level	Filler opening level	– – –
LSD Clutch Torque	7.8 ~ 13 N·m	– – –
	(0.8 ~ 1.3 kgf·m, 69 ~ 115 in·lb)	
Outside Friction Plate Thickness	2.3 ~ 2.4 mm (0.091 ~ 0.094 in.)	2.1 mm (0.083 in.)
Inside Friction Plate Thickness	2.7 ~ 2.8 mm (0.106 ~ 0.110 in.)	2.4 mm (0.094 in.)
Pinion Gear Bearing Preload	1.5 ~ 3.0 N (0.15 ~ 0.31 kgf, 0.34 ~ 0.67 lb)	– – –
Pinion Gear Bearing Preload Torque	0.3 ~ 0.6 N·m (0.03 ~ 0.06 kgf·m, 2.6 ~ 5.2 in·lb)	– – –
Bevel Gear Backlash	0.09 ~ 0.20 mm (0.0035 ~ 0.0079 in.)	– – –
	(at ring gear tooth)	
Bevel Gear Case		
Bevel Gear Backlash	0.07 ~ 0.15 mm (0.0028 ~ 0.0059 in.)	– – –
	(at middle of gear dog side on drive gear shaft)	

Special Tools

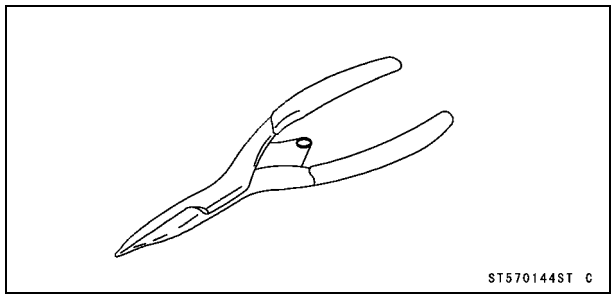
Bearing Puller:
57001-135



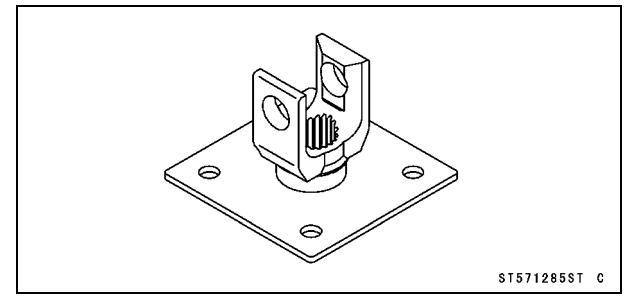
Socket Wrench:
57001-1283



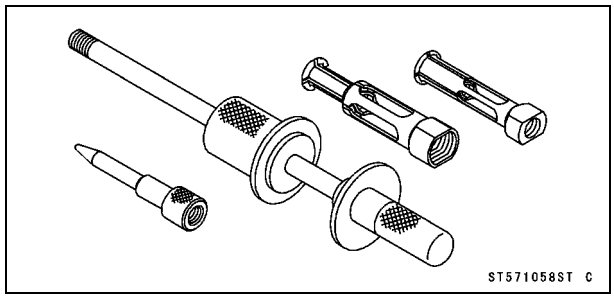
Outside Circlip Pliers:
57001-144



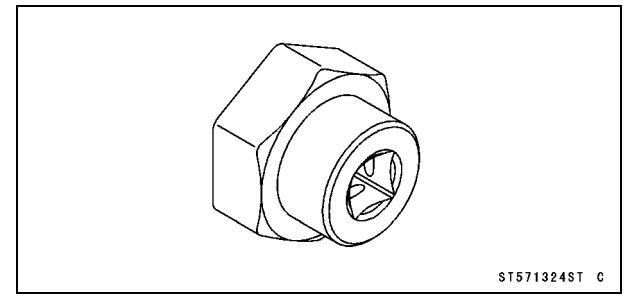
Pinion Gear Holder, m1.0:
57001-1285



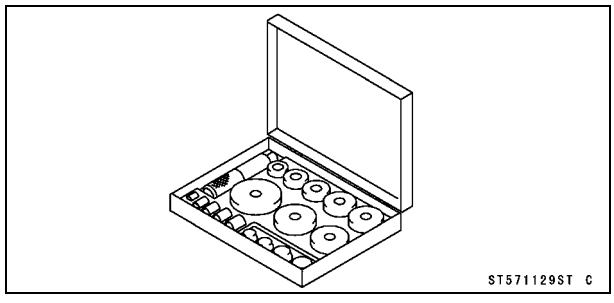
Oil Seal & Bearing Remover:
57001-1058



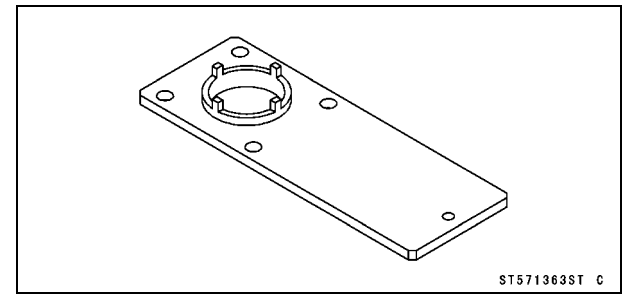
Hexagon Wrench, Hex 40:
57001-1324



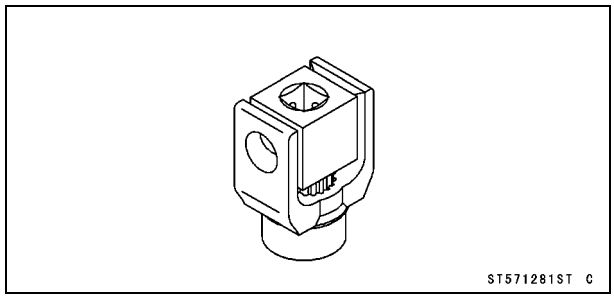
Bearing Driver Set:
57001-1129



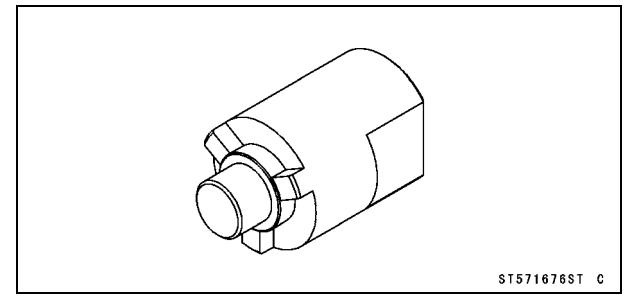
Socket Wrench:
57001-1363



Pinion Gear Holder:
57001-1281



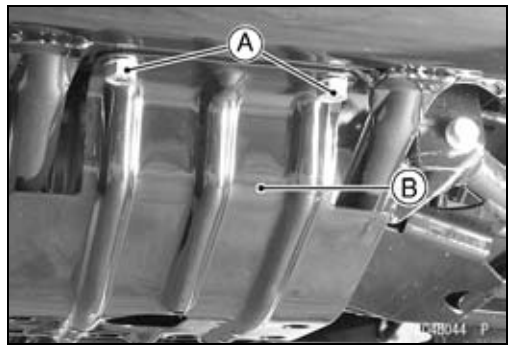
Transmission Gear Holder:
57001-1676

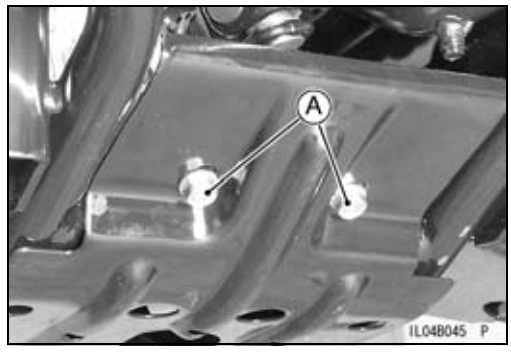


Front Final Gear Case

Front Final Gear Case Oil Level Inspection

- Park the vehicle so that it is level, both side-to-side and front-to-rear.
- Remove:
  Front Final Gear Case Skid Plate Bolts [A]
  Front Final Gear Case Skid Plate [B]

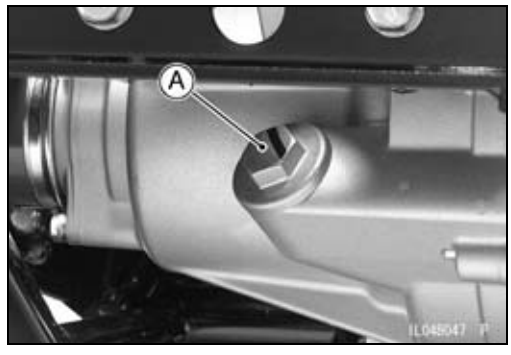




- Remove the filler cap [A].

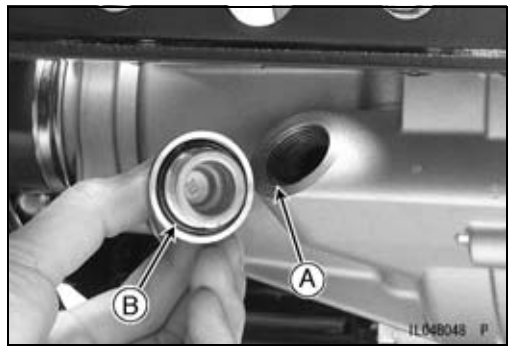
CAUTION

Be careful not to allow any dirt or foreign materials to enter the gear case.



- Check the oil level. The oil level should come to the bottom of the filler opening [A].
- ★ If it is insufficient, first check the front final gear case for oil leakage, remedy it if necessary, and add oil through the filler opening. Use the same type and brand of oil that is already in the final gear case.
- Be sure the O-ring [B] is in place, and tighten the filler cap.

Torque - Oil Filler Cap: 29 N·m (3.0 kgf·m, 21 ft·lb)

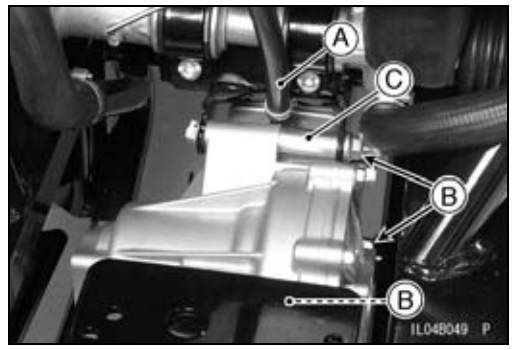


Front Final Gear Case Oil Change

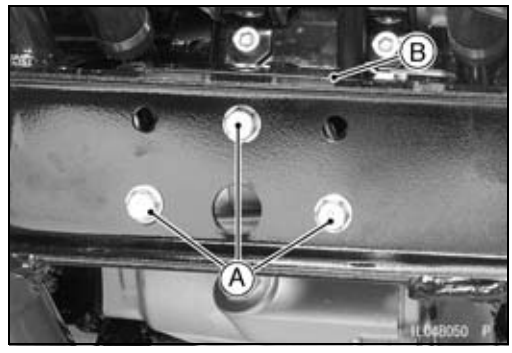
- Refer to the Front Final Gear Case Oil Change in the Periodic Maintenance chapter.

Front Final Gear Case

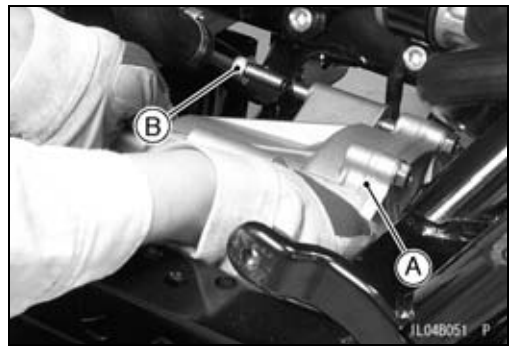
Front Final Gear Case Removal



- Drain the front final gear case oil (see Front Final Gear Case Oil Change in the Periodic Maintenance chapter).
- Remove:
  Radiator (see Radiator Removal in the Cooling System chapter)
  Propeller Shafts (see Propeller Shaft Removal)
  Front Axles (see Front Axle Removal)
  Vent Hose [A]
  Front Final Gear Case Mounting Bolts and Nuts [B]
  Collar [C]



- Remove:
  Front Final Gear Case Bracket Bolts [A]
  Front Final Gear Case Bracket [B]



- Remove the front final gear case [A] together with the mounting bolt [B].

Front Final Gear Case Installation

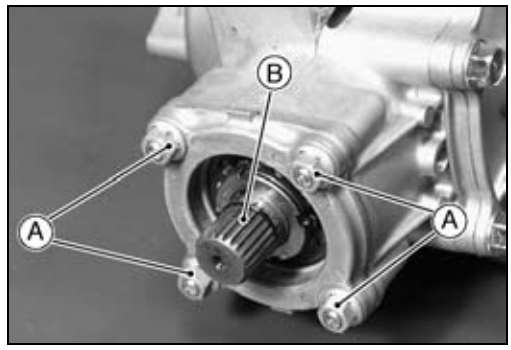
- Run the gear case vent hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:

Torque - Gear Case Bracket Bolts: 44 N·m (4.5 kgf·m, 32 ft·lb)
Gear Case Mounting Nuts: 44 N·m (4.5 kgf·m, 32 ft·lb)

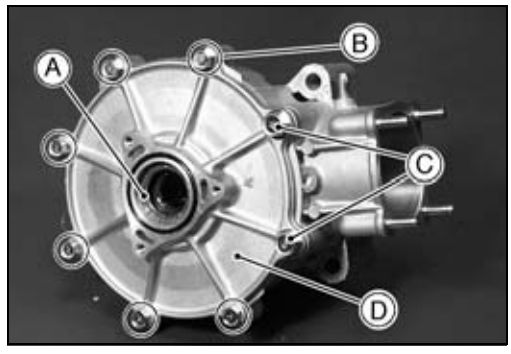
- Adjust the front final gear case oil (see Front Final Gear Case Oil Change in the Periodic Maintenance chapter).

Front Final Gear Case

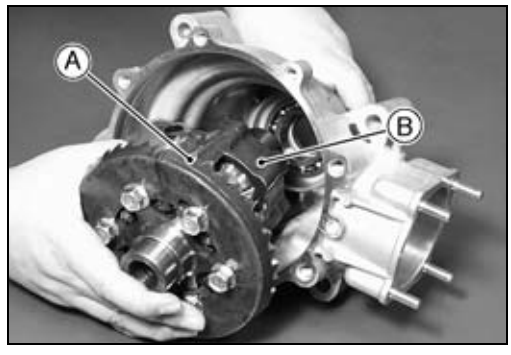
Front Final Gear Case Disassembly



- Remove:
  Front Final Gear Case (see Front Final Gear Case Removal)
  Bearing Housing Nuts [A]
  Pinion Gear Unit [B]

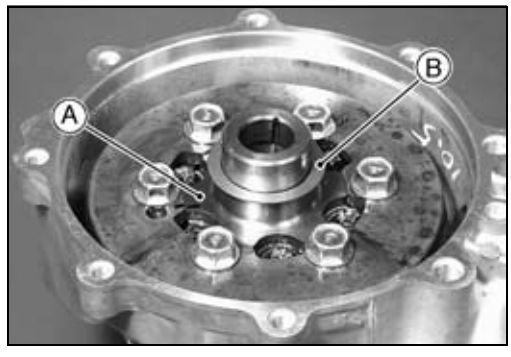


- Remove the spacers [A] on both sides.
- Remove the ring gear cover bolts, starting with the smaller bolts [B].
  Larger Bolts [C]
  Ring Gear Cover [D]



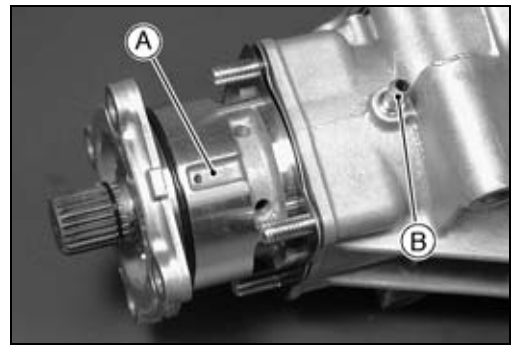
- Remove:
  Ring Gear [A]
  Differential Unit [B]

Front Final Gear Case Assembly



- Visually check the pinion gear and ring gear for scoring, chipping, or other damage.
- ★Replace the bevel gears as a set if either gear is damaged since they are lapped as a set in the factory to get the best tooth contact.
- Check that the ring gear is installed on the correct side of the differential caps [A] as shown in the figure.
- Install the following parts in the order listed.
  Differential Unit and Ring Gear
  Ring Gear Shim [B]
  Ring Gear Cover
  Pinion Gear Unit

Front Final Gear Case



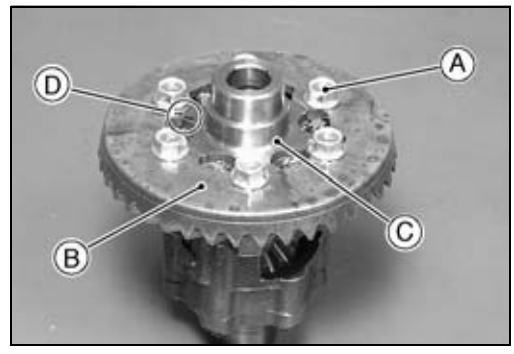
- Install the pinion gear unit with the ring gear side of the case facing down.
- Align the air vent passage [A] with the hose nipple [B].

○First tighten the 10 mm (0.39 in.) bolts, then tighten the 8 mm (0.31 in.) bolts.

Torque - Ring Gear Cover Bolts (M10): 47 N·m (4.8 kgf·m, 35 ft·lb)
Ring Gear Cover Bolts (M8): 25 N·m (2.5 kgf·m, 18 ft·lb)
Pinion Gear Bearing Housing Nuts: 25 N·m (2.5 kgf·m, 18 ft·lb)

- Adjust:
  Front Final Gear Backlash (see Backlash Adjustment)
  Front Final Gear Tooth Contact (see Tooth Contact Adjustment)

Differential Unit and Ring Gear Disassembly



- Remove the differential unit and ring gear (see Front Final Gear Case Disassembly).

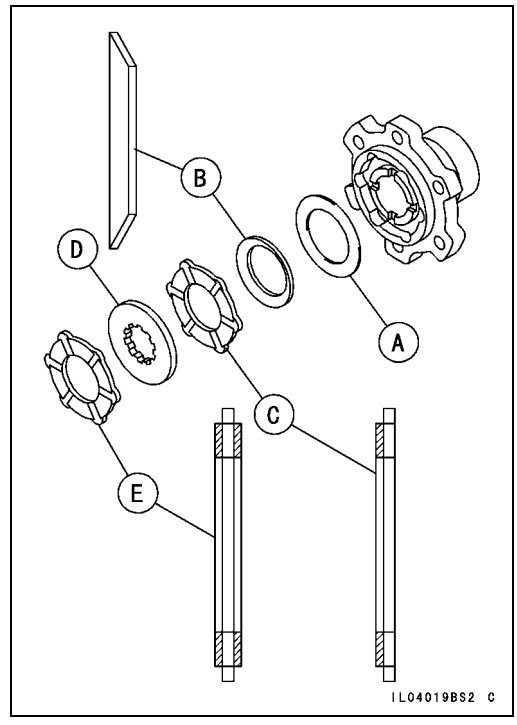
CAUTION
Do not interchange the right and left side parts in the differential unit.

- Remove the following parts to disassemble the differential unit.
  Ring Gear Bolts [A]
  Ring Gear [B]
  Differential Caps [C]
  Mark here to assemble later [D]

○The clutch plates, springs, spring shims and side gears come out.

Differential Unit and Ring Gear Assembly

CAUTION
Be sure to install the right and left side parts of the unit in the original position.

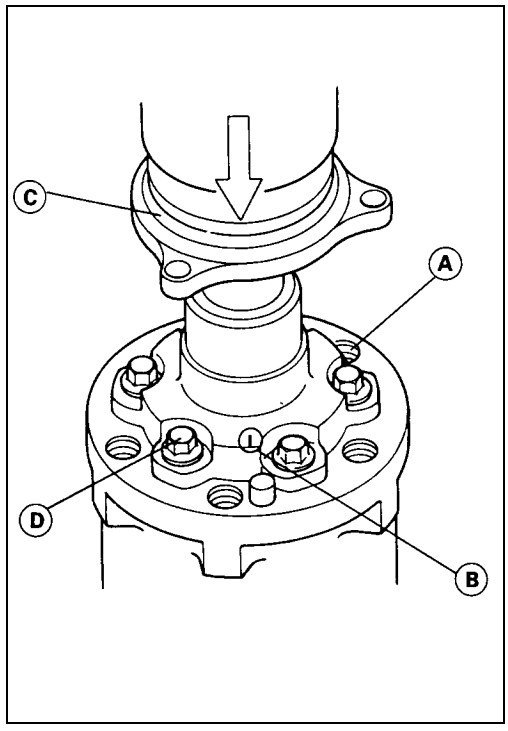


- Inspect the clutch plates (see LSD Clutch Plate Inspection) and the other differential unit parts. Replace any damaged parts.
- Measure and record the thickness of the original clutch spring shim(s).
- Apply specified gear oil to the differential unit parts.
- Note direction and position of the friction plate and the clutch spring.
  Clutch Spring Shim(s) [A]
  Clutch Spring [B]
  Outside Friction Plate [C]
  Steel Plate [D]
  Inside Friction Plate [E]

Front Final Gear Case

- Be sure to assemble the differential unit and inspect the clutch torque (see LSD Clutch Torque Inspection).
  Tapped Holes [A] for Ring Gear
  Mark [B] for assembly
- Install the front axles [C] to center the steel plates.
- Apply a non-permanent locking agent to the threads of the differential case torx bolts [D].
- Tighten:

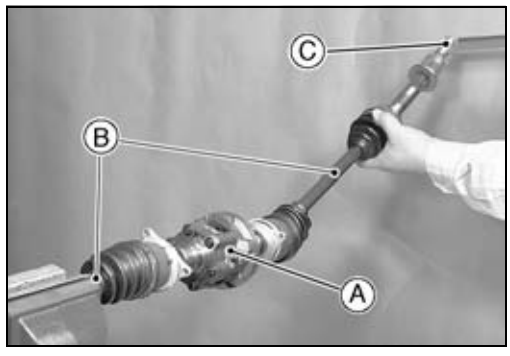
Torque - Differential Case Torx Bolts: 32 N·m (3.3 kgf·m, 24 ft·lb)
Ring Gear Bolts: 49 N·m (5.0 kgf·m, 36 ft·lb)



LSD Clutch Torque Inspection

- After assembling the differential unit and ring gear, check the LSD clutch torque.
- Remove the ring gear from the differential unit [A].
- Insert both front axles [B] in the unit.
- Hold one of the front axles with a vise.
- Install the hub nut on the other axle.
- Measure the clutch torque using a torque wrench [C]. Turn the wrench evenly.

○The clutch torque is the mean torque reading during about a quarter turn of the wrench.



LSD Clutch Torque
Standard: 7.8 ~ 13 N·m (0.8 ~ 1.3 kgf·m, 69 ~ 115 in·lb)

★If the clutch torque is out of the specified range, disassemble the differential unit (see Differential Unit and Ring Gear Disassembly) and replace either of the clutch spring shim(s).

- Also, check the clutch plates and replace them as necessary (see LSD Clutch Plate Inspection).
- To increase clutch torque, increase the thickness of the shim(s).

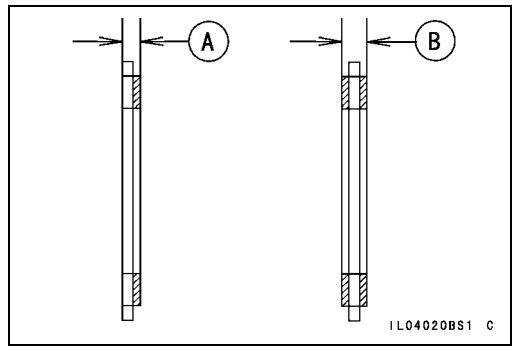
○Change the thickness a little at a time.

- Recheck the clutch torque and readjust as necessary.

Thickness	Part Number
0.8 mm (0.031 in.)	92180-1121
1.0 mm (0.039 in.)	92180-1122
1.2 mm (0.047 in.)	92180-1123
1.4 mm (0.055 in.)	92180-1124
1.6 mm (0.063 in.)	92180-1125

Front Final Gear Case

LSD Clutch Plate Inspection



- Visually inspect the friction plates and steel plates to see if they show any signs of seizure, overheating, or uneven wear.

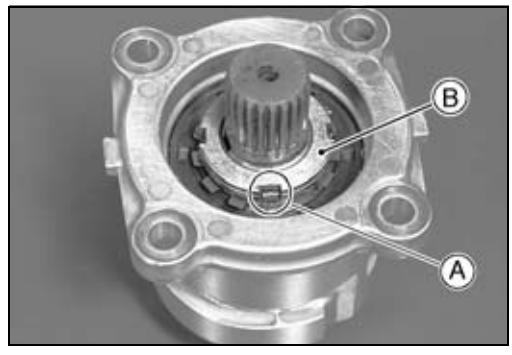
★If any plates show signs of damage, or if the friction plates have worn past the service limit, replace the friction plates and steel plates as a set.

Outside Friction Plate [A]
Inside Friction Plate [B]

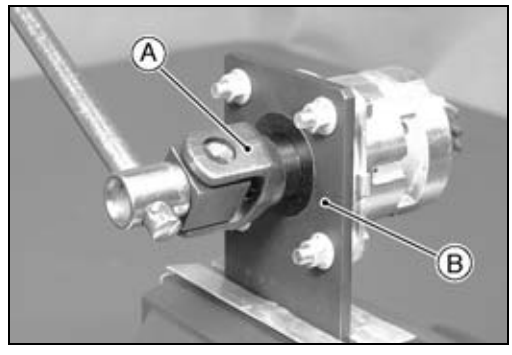
Outside Friction Plate Thickness
Standard: 2.3 ~ 2.4 mm (0.091 ~ 0.094 in.)
Service Limit: 2.1 mm (0.083 in.)

Inside Friction Plate Thickness
Standard: 2.7 ~ 2.8 mm (0.106 ~ 0.110 in.)
Service Limit: 2.4 mm (0.094 in.)

Pinion Gear Unit Disassembly



- Remove the pinion gear unit (see Front Final Gear Case Disassembly).
- Pry open the toothed washer tab [A] on the pinion gear slotted nut [B].



- Unscrew the pinion gear slotted nut.

Special Tools - Pinion Gear Holder [A]: 57001-1281
Socket Wrench [B]: 57001-1283

- Remove the slotted nut, flat washer and toothed washer.
- Pull the pinion gear out of the bearing housing.
- Remove the tapered roller bearing inner race as necessary.

Special Tool - Bearing Puller: 57001-135

Pinion Gear Unit Assembly

- The pinion gear and ring gear are lapped as a set in the factory to get the best tooth contact. They must be replaced as a set.
- Visually inspect the tapered roller bearings for abrasion, color change, or other damage.

★If there is any doubt as to the condition of a bearing, replace the bearing housing and the bearings as a set.

- Be sure to check and adjust the pinion gear bearing preload and the bevel gear backlash and tooth contact, when any of the backlash-related parts are replaced (see Front Final Bevel Gear Adjustment).

○When the pinion gear slotted nut is loosened, even if the purpose is not to replace the parts, check and adjust the bearing preload.

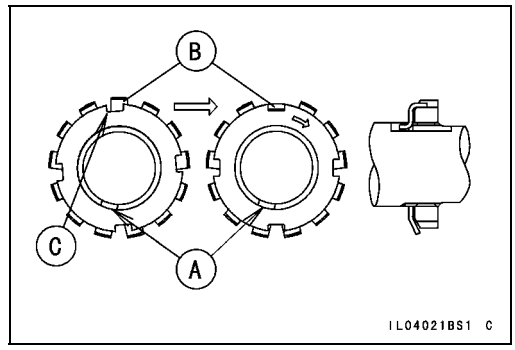
Front Final Gear Case

- Fit the toothed washer claw [A] into the shaft.
- Apply molybdenum disulfide oil solution to the threads and seating surface of the pinion gear slotted nut, and tighten it.

Torque - Pinion Gear Slotted Nut: 118 N·m (12.0 kgf·m, 87.0 ft·lb)

★If none of the toothed washer tabs [B] align, tighten the nut further just enough to align one of the tabs with a slot [C] in the nut.

- Bend the tab over the nut.

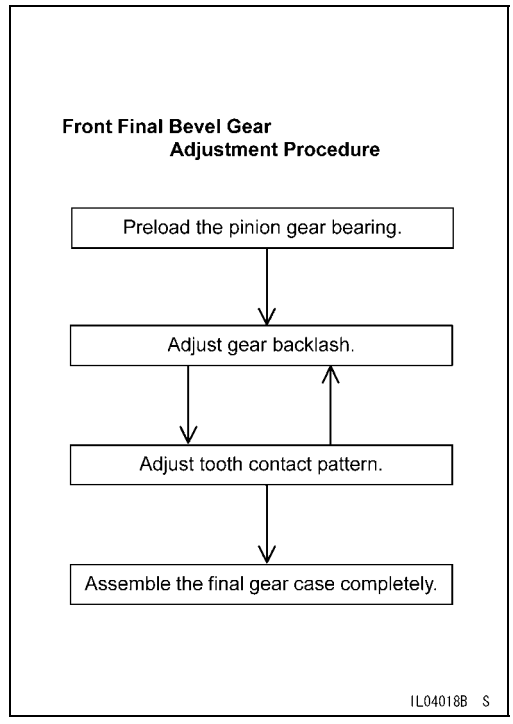


Front Final Bevel Gear Adjustment

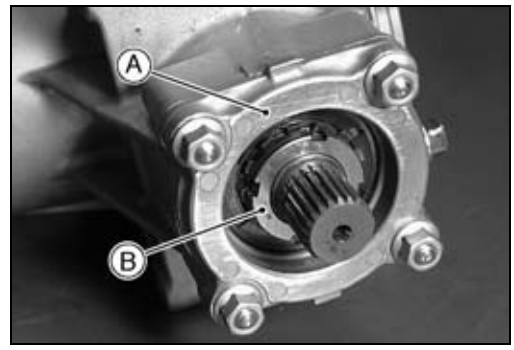
In order to prevent one gear from moving away from the other gear under load, the tapered roller bearings must be properly **preloaded**. Also the **backlash** (distance one gear will move back and forth without moving the other gear) and **tooth contact pattern** of the bevel gears must be correct to prevent the gears from making noise and being damaged.

Above three adjustments are of critical importance and must be carried out following the correct sequence and method.

- When any one of the backlash-related parts are replaced or the pinion gear nut is loosened; even if the purpose is not to replace the parts, check and adjust the bearing preload, the bevel gear backlash, and tooth contact by replacing shims.
- The amount of backlash is influenced by the ring gear position more than by the pinion gear position.
- Tooth contact location is influenced by pinion gear position more than by ring gear position.



Front Final Gear Case



Bearing Preload Adjustment

- Check and adjust the bearing preload in the following cases.

○When any of the parts listed below are replaced with new ones.

Pinion Gear
Collar
Shim
Tapered Roller Bearings
Pinion Gear Bearing Housing [A]
Oil Seal Collar

○When the pinion gear slotted nut [B] is loosened; even if the nut is not removed.

- Install the pinion gear bearing housing and tighten the pinion gear slotted nut to the specified torque (see Pinion Gear Unit Assembly).
- Do not install the oil seal and O-rings, and do not lock the washer until the correct bearing preload is obtained.

CAUTION

To start with, choose a shim or collar so that the bearings are just SNUG with NO play but also with NO preload.
An over-preload on the bearings could damage the bearings.

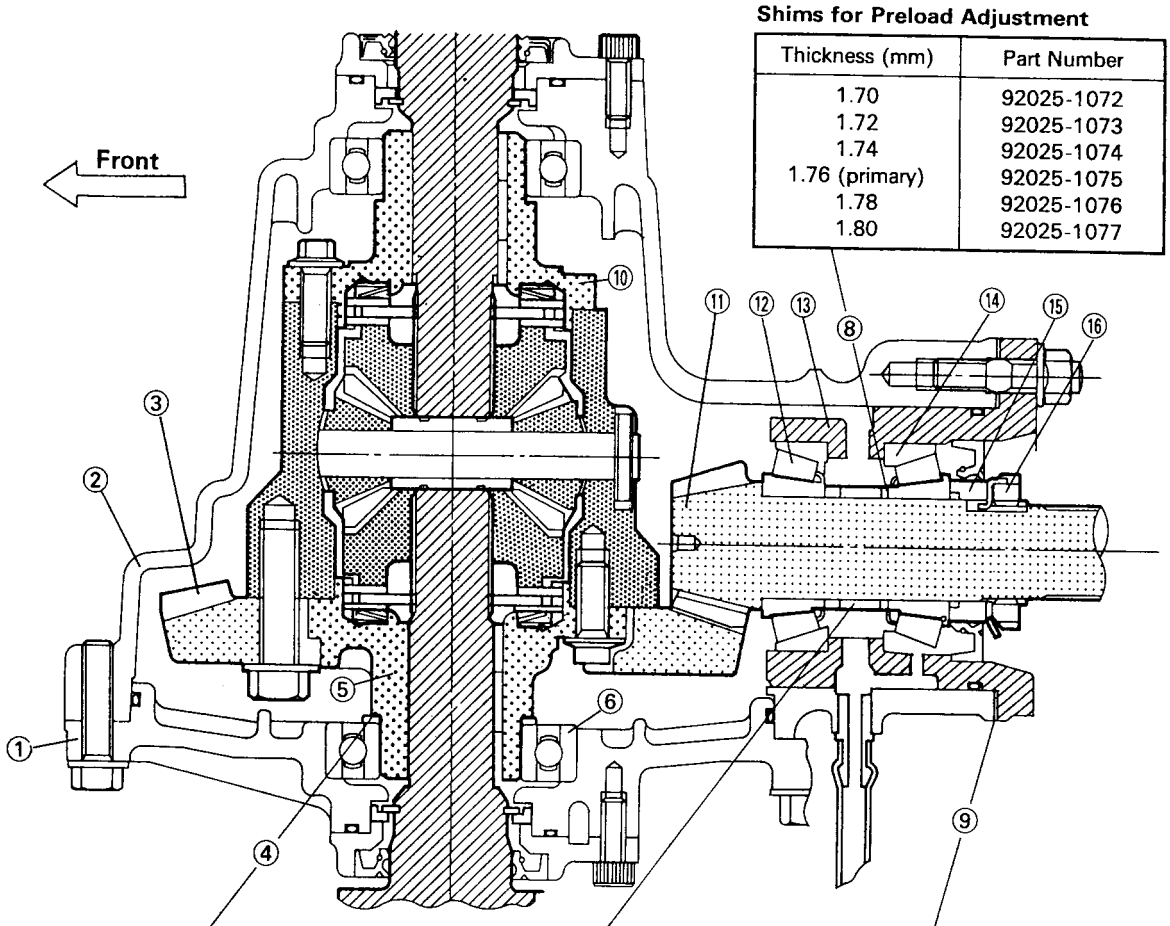
- Apply specified gear oil to the bearings, and turn the gears more than 5 turns to allow the bearings to seat.
- Measure the bearing preload. Bearing preload is the force or torque which is needed to start the gear shaft turning.

NOTE

○*Preload can be measured either with a spring scale or a beam-type torque wrench. When measured with a spring scale, the preload is designated by force (N, kgf, lb), and when measured with a torque wrench, it is designated by torque (N·m, kgf·m, in·lb).*

Front Final Gear Case

Front Final Gear Case (Backlash-Related Parts)



Shims for Preload Adjustment

Thickness (mm)	Part Number
1.70	92025-1072
1.72	92025-1073
1.74	92025-1074
1.76 (primary)	92025-1075
1.78	92025-1076
1.80	92025-1077

Ring Gear Shims for Backlash Adjustment

Thickness (mm)	Part Number
0.1	92025-1850
0.15	92025-1851
0.5	92025-1856
0.8	92025-1857
1.0 (primary)	92025-1849

Pinion Gear Shims for Tooth Contact Adjustment

Thickness (mm)	Part Number
0.1	92025-1919
0.15	92025-1920
0.5	92025-1921
0.8	92025-1922
1.0 (primary)	92025-1923
1.2	92025-1924

Collar for Preload Adjustment

Thickness (mm)	Part Number
10.2	92027-1401
10.3	92027-1402
10.4	92027-1403
10.5	92027-1404
10.6	92027-1405
10.7 (primary)	92027-1406
10.8	92027-1407
10.9	92027-1408
11.0	92027-1409
11.1	92027-1410
11.2	92027-1411

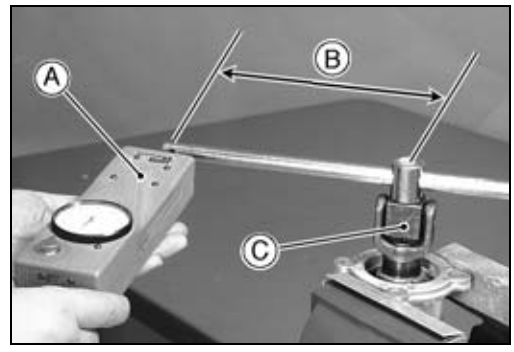
1. Ring Gear Cover
2. Front Final Gear Case
3. Ring Gear
4. Ring Gear Shims for Backlash Adjustment
5. Left Differential Cap
6. Ball Bearing
7. Collar for Preload Adjustment (affects preload only)
8. Shims for Preload Adjustment (affects preload only)
9. Pinion Gear Shims for Tooth Contact Adjustment
10. Right Differential Cap
11. Pinion Gear
12. Tapered Roller Bearing
13. Pinion Gear Bearing Housing
14. Tapered Roller Bearing (affects preload only)
15. Oil Seal Collar (affects preload only)
16. Pinion Gear Slotted Nut (affects preload only)

Front Final Gear Case

★If the preload is out of the specified range, replace the collar and/or shim(s).
○To increase preload, decrease the size of the shim(s) or collar. To decrease preload, increase the size of the shim(s) or collar.
○Change the thickness a little at a time.
● Recheck the bearing preload, and readjust as necessary.

● Measure the bearing preload using a spring scale.

Using Spring Scale
Pinion Gear Bearing Preload:
1.5 ~ 3.0 N (0.15 ~ 0.31 kgf, 0.34 ~ 0.67 lb)



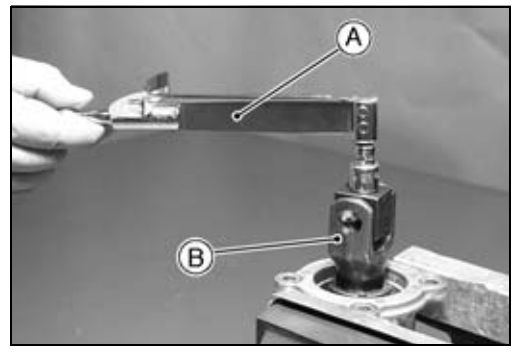
○Hook the spring scale [A] on the handle at a point 200 mm (7.87 in.) [B] apart from the center of the gear shaft. Hold the bearing housing in a vise so that the gear shaft is vertical.
○Apply force to the handle horizontally and at a right angle to it.

Special Tool - Pinion Gear Holder [C]: 57001-1281

● Measure the bearing preload using a torque wrench [A].

Using Torque Wrench
Pinion Gear Bearing Preload Torque:
0.3 ~ 0.6 N·m (0.03 ~ 0.06 kgf·m, 2.6 ~ 5.2 in·lb)

Special Tool - Pinion Gear Holder [B]: 57001-1281



Backlash Adjustment

● Check and adjust the gear backlash when any of the backlash-related parts are replaced with new ones.
● Clean any dirt and oil off the bevel gear teeth.
● Assemble the front final gear case (see Front Final Gear Case Assembly). Do not install the O-rings during adjustment.
○Check the backlash during tightening of the ring gear cover bolts and stop tightening them immediately if the backlash disappears. Then, change the ring gear shim to a thinner one.
● Set up a dial gauge against a ring gear tooth to check gear backlash shown.
● To measure the backlash, move the left front axle (ring gear side) back and forth while holding the pinion gear steady. The difference between the highest and the lowest gauge reading is the amount of backlash.
★If the backlash is not within the limit, replace the ring gear shims. To increase backlash, decrease the thickness of the shim(s). To decrease backlash, increase the thickness of the shim(s).
○Change the thickness a little at a time.
● Recheck the backlash, and readjust as necessary.

Front Final Gear Case

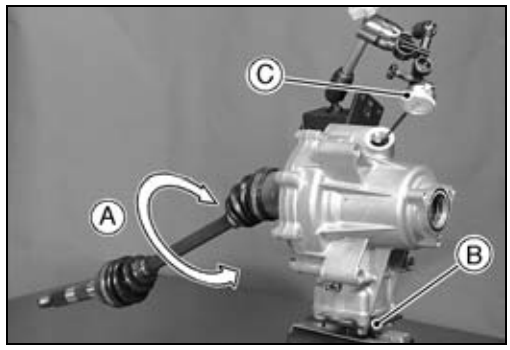
● Move the front axle back and forth [A].

Special Tool - Pinion Gear Holder, m1.0 [B]: 57001-1285

Dial Gauge [C]

Bevel Gear Backlash

Standard: 0.09 ~ 0.20 mm (0.0035 ~ 0.0079 in.) (at ring gear tooth)



Tooth Contact Adjustment

● Clean any dirt and oil off the bevel gear teeth.

● Apply checking compound to 4 or 5 teeth on the pinion gear.

NOTE

○*Apply checking compound to the teeth in a thin, even coat with a fairly stiff paint brush. If painted too thickly, the exact tooth pattern may not appear.*

○*The checking compound must be smooth and firm, with the consistency of tooth paste.*

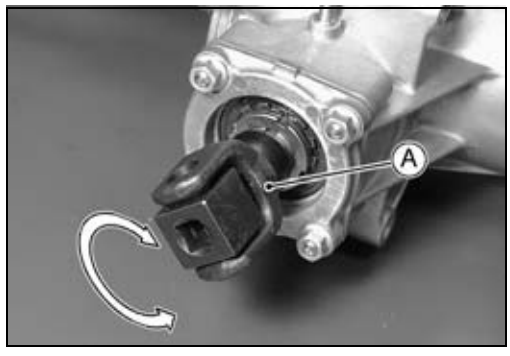
○*Special compounds are available from automotive supply stores for the purpose of checking differential gear tooth patterns and contact. Use one of these for checking the bevel gears.*

● Assemble the front final gear case (see Front Final Gear Case Assembly). Do not install the O-rings during adjustment.

● Turn the pinion gear shaft for one revolution in the drive and reverse (coast) direction, while creating a drag on the ring gear.

○Use the pinion gear holder [A] and the left front axle.

Special Tool - Pinion Gear Holder: 57001-1281



● Remove the ring gear and pinion gear unit to check the drive pattern and coast pattern of the bevel gear teeth.

○The tooth contact patterns of both (drive and coast) sides should be centrally located between the top and bottom of the tooth. The drive pattern can be a little closer to the toe and the coast pattern can be a somewhat longer and closer to the toe.

★If the tooth contact pattern is incorrect, replace the pinion gear shim(s), following the examples shown.

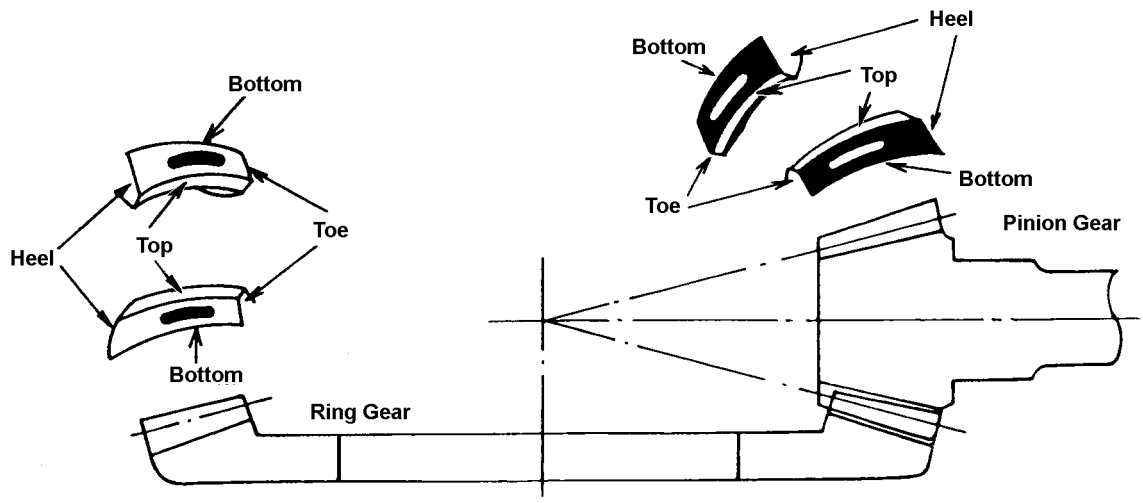
● Then erase the tooth contact patterns and check them again. Also check the backlash every time the shim(s) are replaced. Repeat the shim change procedure as necessary.

NOTE

○*If the backlash is out of the standard range after changing the pinion gear shim(s), change the ring gear shim(s) to correct the backlash before checking the tooth contact pattern.*

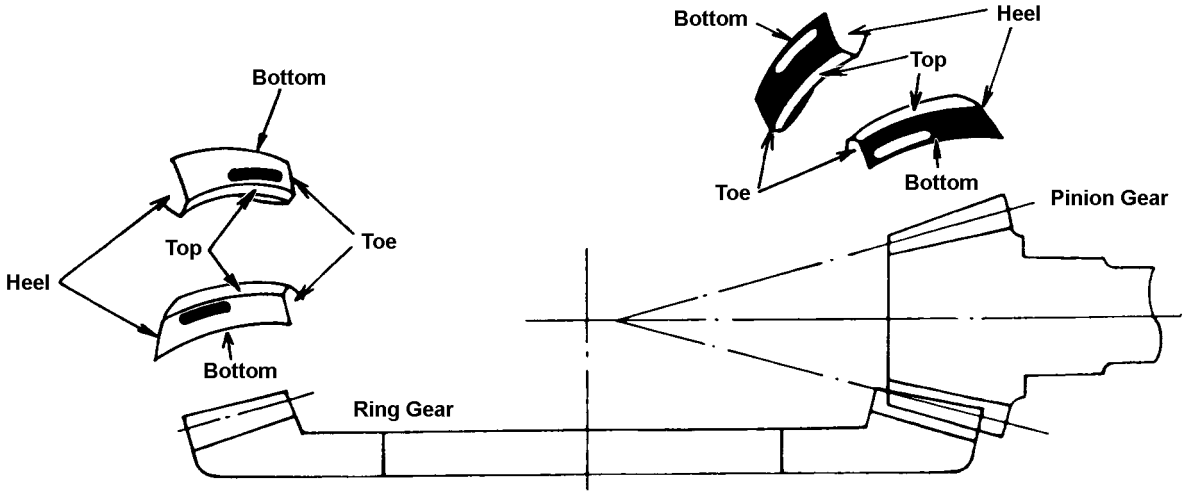
Front Final Gear Case

Correct Tooth Contact Pattern: No adjustment is required.

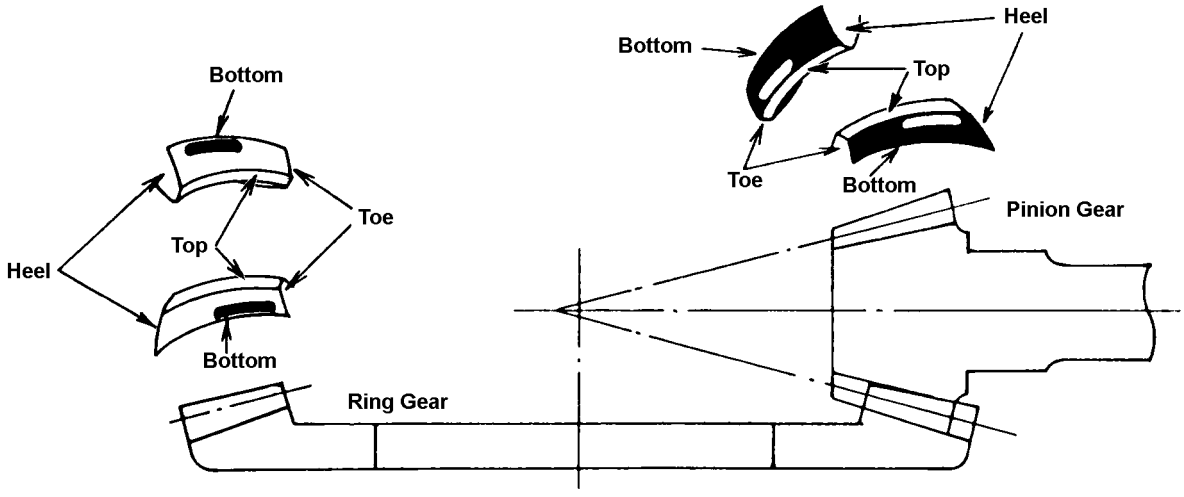


Incorrect Tooth Contact Patterns

Example 1 : Decrease the thickness of the pinion gear shim(s) by 0.05 mm (0.002 in.) to correct the pattern shown below. Repeat in 0.05 mm (0.002 in.) steps if necessary.



Example 2 : Increase the thickness of the pinion gear shim(s) by 0.05 mm (0.002 in.) to correct the pattern shown below. Repeat in 0.05 mm (0.002 in.) steps if necessary.

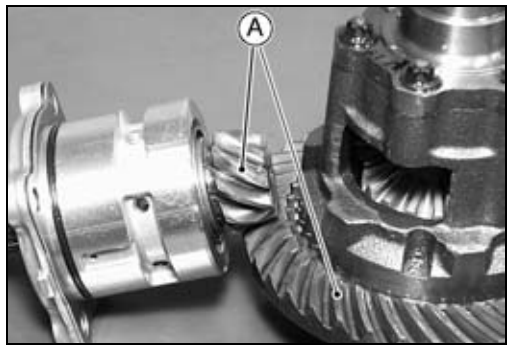


Front Final Gear Case

Bevel Gear Inspection

- Visually check the bevel gears [A] for scoring, chipping, or other damage.

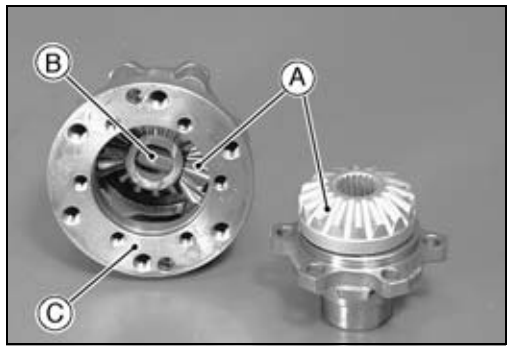
★Replace the bevel gears as a set if either gear is damaged.



Differential Gear Inspection

- Visually check the differential gears [A] for scoring, chipping, or other damage.
- Also, inspect the differential pinion gear shaft [B] and gear housing [C] where the differential gears rub.

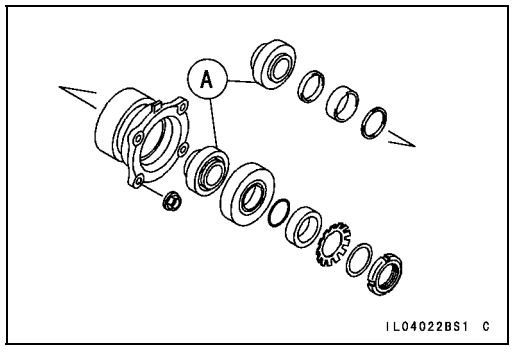
★If they are scored, discolored, or otherwise damaged, replace them as a set.



Tapered Roller Bearing Inspection

- Visually inspect the bearings [A] for abrasion, color change, or other damage.

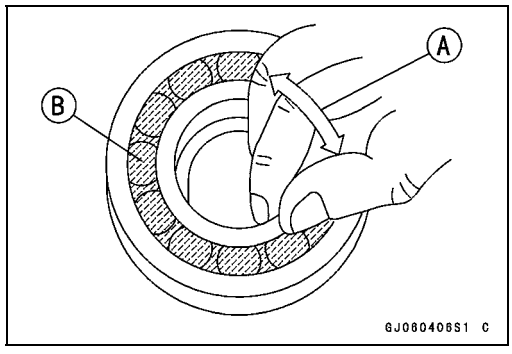
★If there is any doubt as to the condition of a bearing, replace it.



Ball Bearing Inspection

- Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high-flash point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.
- Spin [A] the bearing by hand to check its condition.

★If the bearing [B] is noisy, does not spin smoothly, or has any rough spots, replace it.



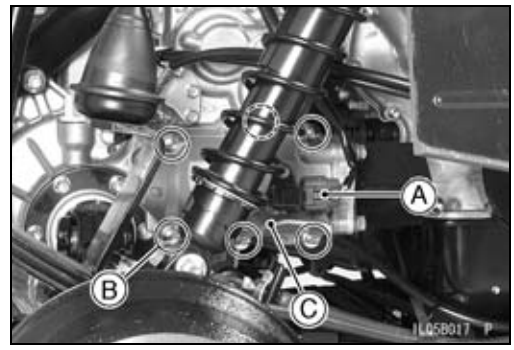
Oil Seal Inspection

- Visually inspect the oil seal.

★Replace it if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened, or been otherwise damaged.

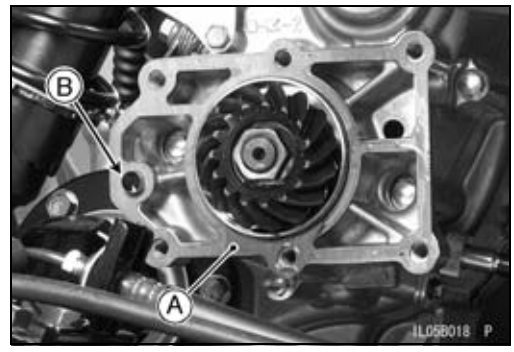
Bevel Gear Case

Bevel Gear Case Removal



- Drain the transmission oil (see Transmission Oil Change in the Periodic Maintenance chapter).
- Remove:
  Cargo Bed (see Cargo Bed Removal in the Frame chapter)
  Propeller Shaft (see Propeller Shaft Removal)
  Right Rear Wheel (see Wheel Removal in the Wheels/Tires chapter)
  Speed Sensor Lead Connector [A]
  Bevel Gear Case Bolts [B]
  Bevel Gear Case [C]

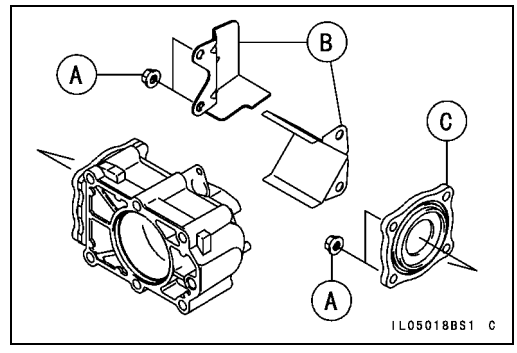
Bevel Gear Case Installation



- Check and adjust the bevel gear backlash and tooth contact when any of the backlash-related parts are replaced (see Bevel Gear Adjustment).
- Replace the bevel gear case gasket [A] with a new one.
- Check to see that the bevel gear case dowel pin [B] is in place.
- Tighten:

Torque - Bevel Gear Case Bolts: 22 N·m (2.2 kgf·m, 16 ft·lb)

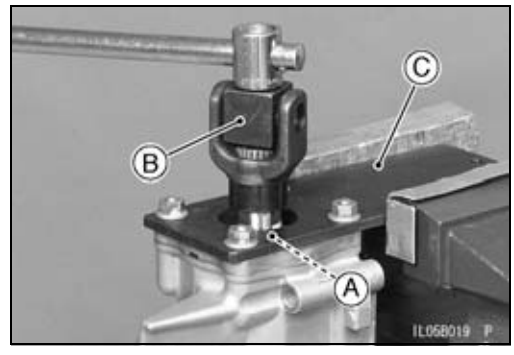
Bevel Gear Case Disassembly



- Remove:
  Speed Sensor (see Speed Sensor Removal in the Electrical System chapter)
  Holder Nuts [A]
  Covers [B]
  Holder [C]

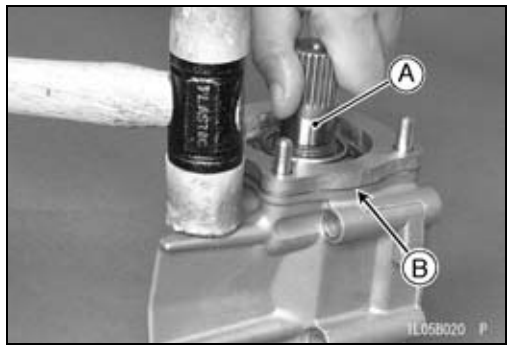
★If the driven gear assembly is to be disassembled, loosen the housing locknut [A].

Special Tools - Pinion Gear Holder [B]: 57001-1281
Socket Wrench [C]: 57001-1363



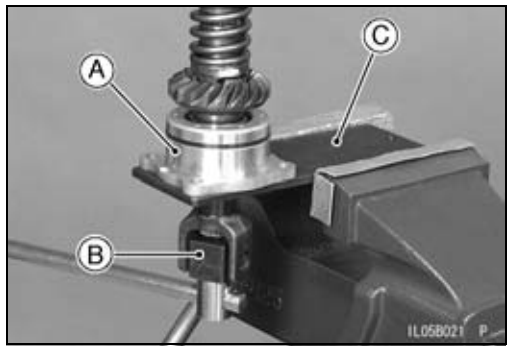
Bevel Gear Case

- Remove:
  Driven Gear Assembly [A]
  Driven Gear Shim(s) [B]



- Remove:
  Housing Locknut
  Bearing Housing [A]

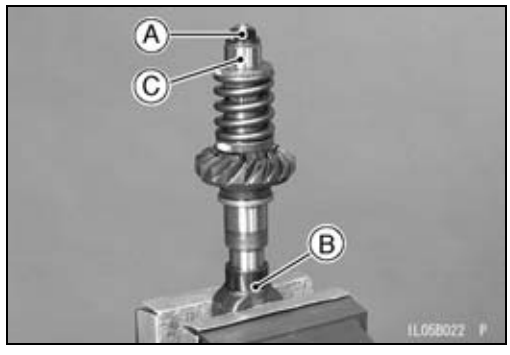
  Special Tools - Pinion Gear Holder [B]: 57001-1281
  Socket Wrench [C]: 57001-1363



- Remove the driven gear shaft nut [A].

  Special Tool - Pinion Gear Holder [B]: 57001-1281

○Pressing the spring seat [C], remove the driven gear shaft nut.

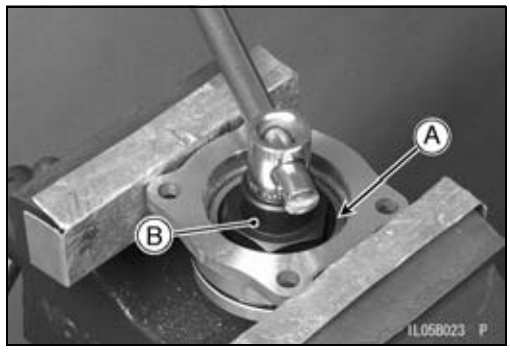


- Remove the bearing holder [A].

  Special Tool - Hexagon Wrench, Hex 40 [B]: 57001-1324

- Remove the ball bearings.

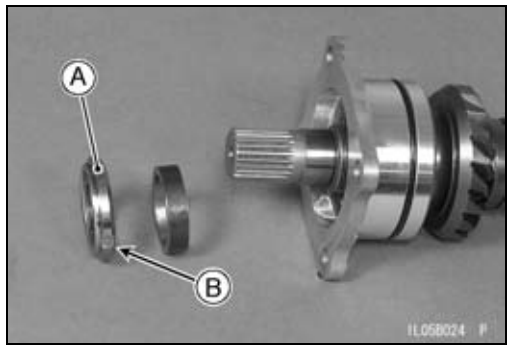
  Special Tools - Oil Seal & Bearing Remover: 57001-1058
  Bearing Driver Set: 57001-1129



Bevel Gear Case Assembly

- Install the housing locknut [A] so that the chamfered side [B] faces to the bearing.
- Apply a non-permanent locking agent to the threads of the following parts.
  Driven Gear Shaft Nut
  Bearing Holder
  Housing Locknut
- Tighten:

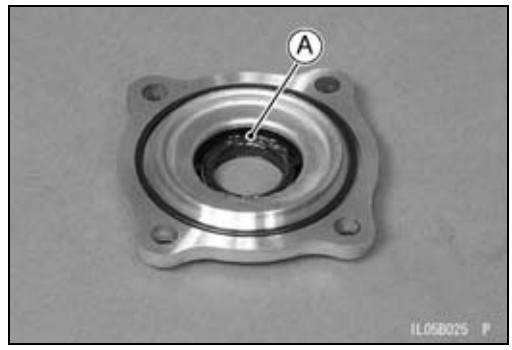
  Torque - Driven Gear Shaft Nut: 108 N·m (11.0 kgf·m, 79.7 ft·lb)
  Bearing Holder: 118 N·m (12.0 kgf·m, 87.0 ft·lb)
  Housing Locknut: 118 N·m (12.0 kgf·m, 87.0 ft·lb)



Bevel Gear Case

- Apply grease to the oil seal lips [A].
- Tighten:

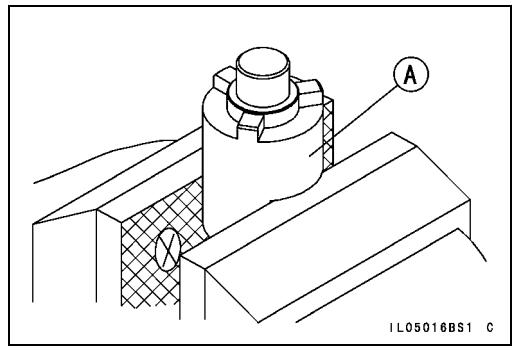
Torque - Bevel Gear Case Holder Nuts: 25 N·m (2.5 kgf·m, 18 ft·lb)



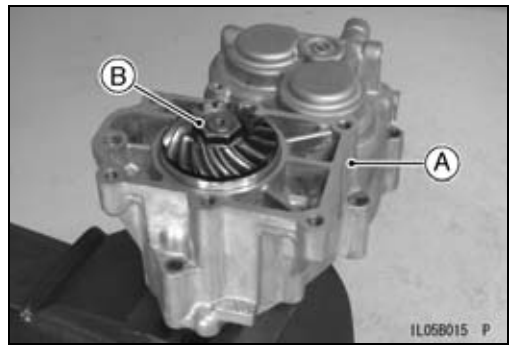
Drive Bevel Gear Removal

- Remove the hi/low gear case (see Hi/Low Gear and Shift Mechanism Removal in the Transmission chapter).
- Hold the transmission gear holder [A] in a vise.

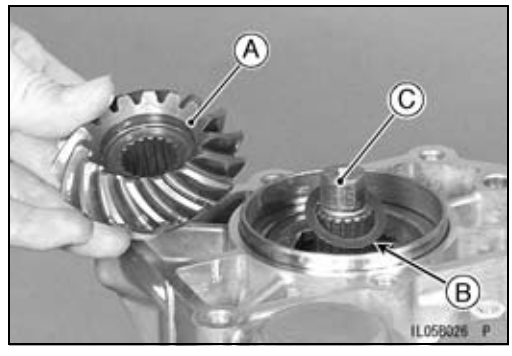
Special Tool - Transmission Gear Holder: 57001-1676



- Set the hi/low gear case [A] onto the gear holder.
- Remove the drive gear nut [B].



- Remove:
  Drive Gear [A]
  Drive Gear Shim(s) [B]
  Drive Gear Shaft [C]



Drive Bevel Gear Installation

- Check and adjust the bevel gear backlash and tooth contact when any of the backlash-related parts are replaced (see Bevel Gear Adjustment).
- Apply molybdenum disulfide oil solution to the seating surface of the drive gear nut.
- Tighten:

Torque - Drive Gear Nut: 118 N·m (12.0 kgf·m, 87.0 ft·lb)

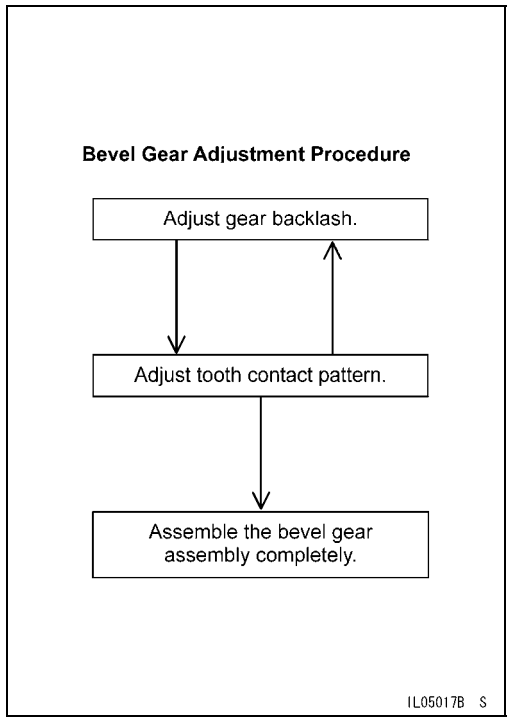
Bevel Gear Case

Bevel Gear Adjustment

In order to prevent one gear from moving away from the other gear under load, the **backlash** and **tooth contact pattern** of the bevel gears must be correct to prevent the gears from making noise and being damaged.

When replacing any one of the backlash-related parts, be sure to check and adjust the backlash and tooth contact. First adjust the backlash, and then tooth contact by replacing shims.

These two adjustments are of critical importance and must be carried out in the correct sequence, using the procedures shown.



Backlash Adjustment

- Check and adjust the gear backlash when any of the backlash-related parts are replaced with new ones.
- Install the drive gear with the primary shim and assemble the driven gear with the primary shim. Do not install the bevel gear case holder during adjustment.
- Clean any dirt and oil off the bevel gear teeth.
- Install the bevel gear case and tighten the case bolts.

○Check the backlash while tightening the case bolts. Stop tightening them immediately if the backlash disappears and change the shim to a thinner one.

- Hold the driven gear shaft [A] with a vice.

○Protect the driven gear shaft with aluminum plates [B].

- Set up a dial gauge [C] against the middle point [D] of the gear dog side [E].

○The middle point is position at about 23.5 mm (0.925 in.) [F] from center.

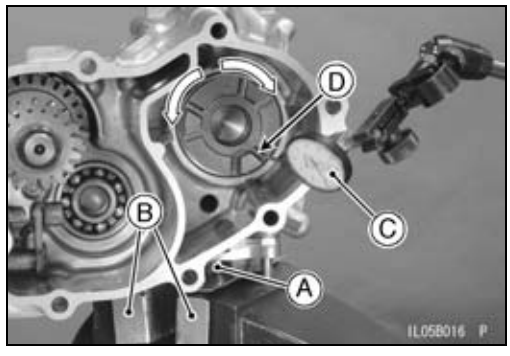
Gear Dog [G]

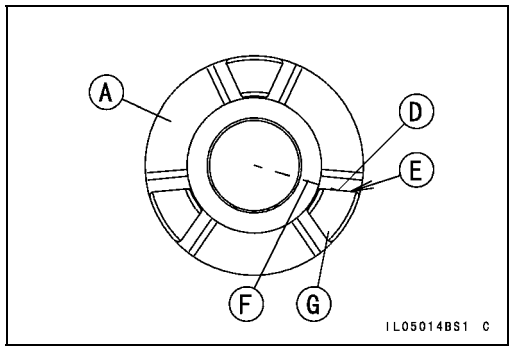
- To measure the backlash, turn the shaft clockwise and counterclockwise. The distance between the highest and lowest gauge reading is the amount of backlash.

★If the backlash is not within the limit, replace the shim(s) at the drive and/or driven gear. To increase backlash, decrease the thickness of the shim(s). To decrease backlash, increase the thickness of the shim(s).

★Change the thickness a little at a time.

- Recheck the backlash, and readjust as necessary.



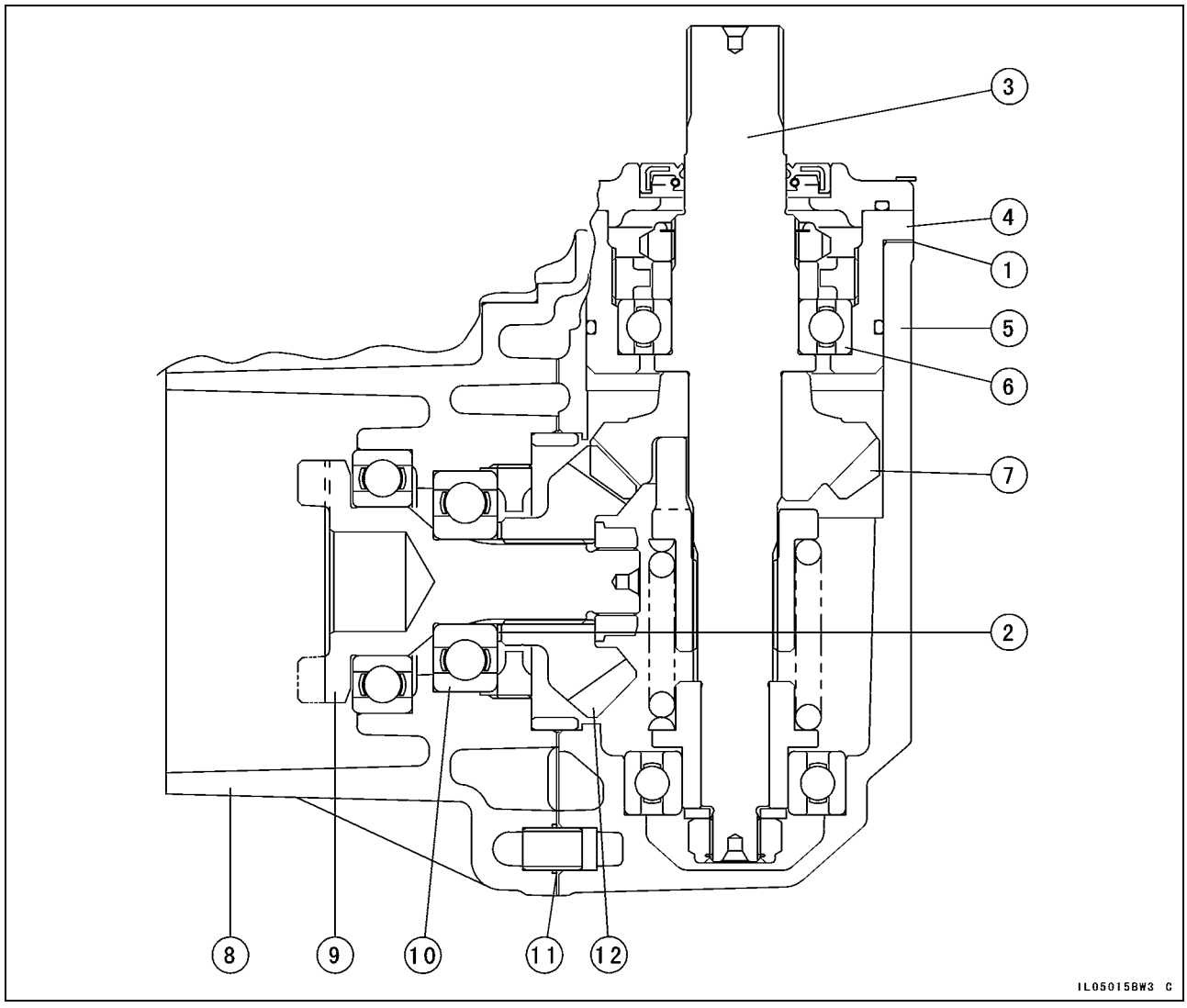


Bevel Gear Backlash

Standard: 0.07 ~ 0.15 mm (0.0028 ~ 0.0059 in.) (at middle of gear dog side on drive gear shaft)

Bevel Gear Case

Bevel Gear Case (Backlash-Related Parts)



1. Driven Gear Shim(s)
2. Drive Gear Shim(s)
3. Driven Gear Shaft
4. Bearing Housing
5. Bevel Gear Case
6. Ball Bearing
7. Driven Bevel Gear
8. Hi/Low Gear Case
9. Drive Gear Shaft
10. Ball Bearing
11. Gasket
12. Drive Bevel Gear

1. Driven Gear Shims

Thickness	Part Number
0.1 mm (0.004 in.)	92025-1859
0.15 mm (0.006 in.)	92025-1860
0.5 mm (0.020 in.)	92025-1861
0.8 mm (0.031 in.)	92025-1862
1.0 mm (0.039 in.) (primary)	92025-1858
1.2 mm (0.047 in.)	92025-1863

Bevel Gear Case

2. Drive Gear Shims

Thickness	Part Number
0.15 mm (0.006 in.)	92025-1573
0.2 mm (0.008 in.)	92025-1574
0.7 mm (0.028 in.)	92025-1534
0.8 mm (0.031 in.)	92025-1535
0.9 mm (0.035 in.)	92025-1536
1.0 mm (0.039 in.) (primary)	92025-1537
1.1 mm (0.043 in.)	92025-1575
1.2 mm (0.047 in.)	92025-1538
1.3 mm (0.051 in.)	92025-1533

Tooth Contact Adjustment

- Clean any dirt and oil off the bevel gear teeth.
- Apply checking compound to 4 or 5 teeth on the driven bevel gear.

NOTE

○*Apply checking compound to the teeth in a thin, even coat with a fairly stiff paint brush. If painted too thickly, the exact tooth pattern may not appear.*

○*The checking compound must be smooth and firm with the consistency of tooth paste.*

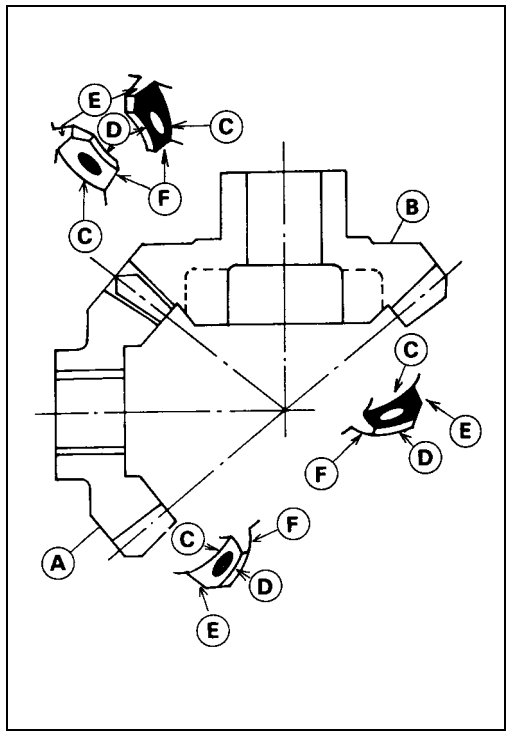
○*Special compounds are available from automotive supply stores for the purpose of checking differential gear tooth patterns and contact. Use this for checking the bevel gears.*

- Turn the driven bevel gear for 3 or 4 turns in the drive and reverse (coast) directions, while creating a drag on the drive bevel gear.
- Check the drive pattern and coast pattern of the bevel gear teeth. The tooth contact patterns of both drive and coast sides should be centrally located between the top and bottom of the tooth, and a little closer to the toe of the tooth.

★If the tooth contact pattern is incorrect, replace the shim(s) at the drive bevel gear and shim(s) at the driven bevel gear, following the examples shown. Then erase the tooth contact patterns, and check them again. Also check the backlash every time the shims are replaced. Repeat the shim change procedure as necessary.

NOTE

○*If the backlash is out of the standard range after changing shims, correct the backlash before checking the tooth contact pattern.*



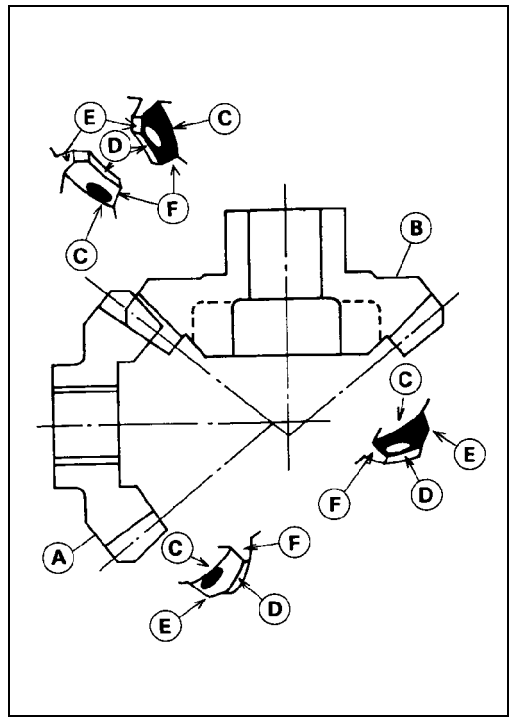
Drive Bevel Gear [A]
Driven Bevel Gear [B]
Bottom [C]
Top [D]
Heel [E]
Toe [F]

Bevel Gear Case

Incorrect Tooth Contact Patterns

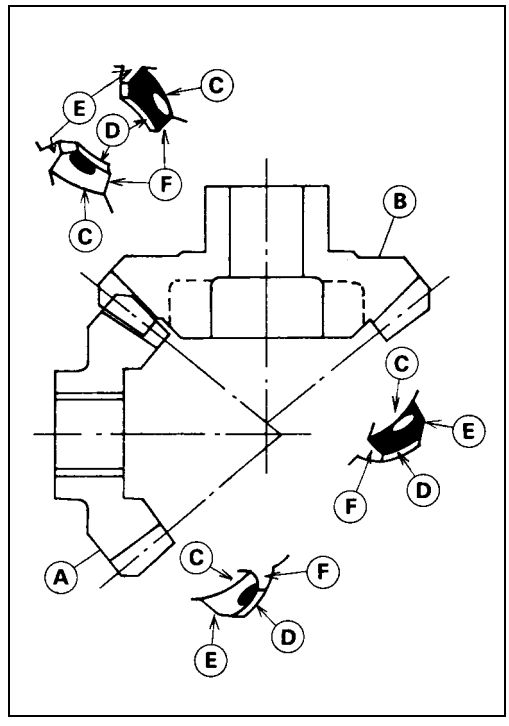
Example 1: Increase the thickness of the drive bevel gear shim(s) by 0.05 mm (0.002 in.), and/or increase the thickness of the driven bevel gear shim(s) by 0.05 mm (0.002 in.) to correct the pattern shown below. Repeat in 0.05 mm (0.002 in.) steps if necessary.

Drive Bevel Gear [A]
Driven Bevel Gear [B]
Bottom [C]
Top [D]
Heel [E]
Toe [F]



Example 2: Decrease the thickness of the drive bevel gear shim(s) by 0.05 mm (0.002 in.), and/or decrease the thickness of the driven bevel gear shim(s) by 0.05 mm (0.002 in.) to correct the pattern shown below. Repeat in 0.05 mm (0.002 in.) steps if necessary.

Drive Bevel Gear [A]
Driven Bevel Gear [B]
Bottom [C]
Top [D]
Heel [E]
Toe [F]



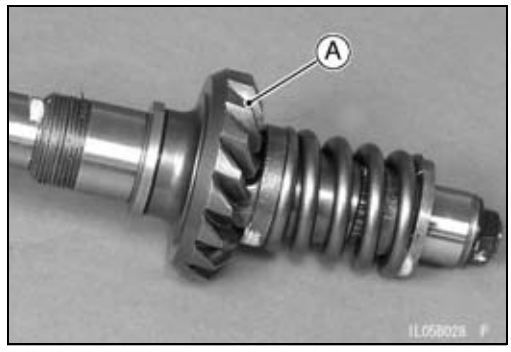
Bevel Gear Case

Bevel Gear Inspection

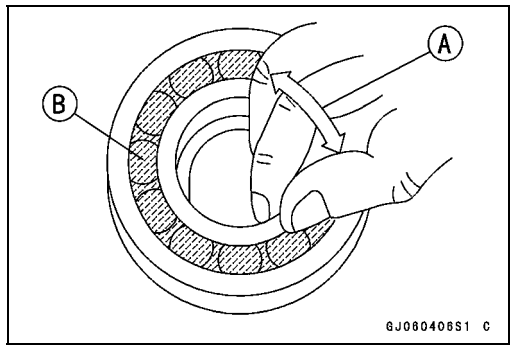


- Visually check the bevel gears [A] for scoring, chipping, or other damage.

★Replace the bevel gears as a set if either gear is damaged.



Ball Bearing Inspection



- Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high-flash point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.
- Spin [A] the bearing by hand to check its condition.

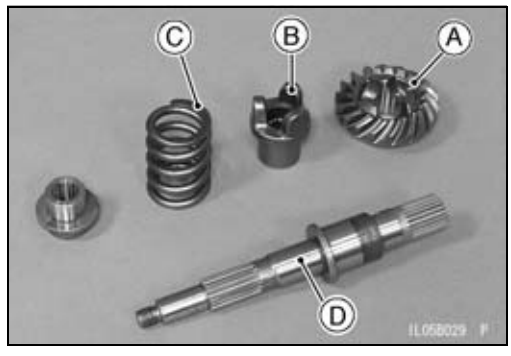
★If the bearing [B] is noisy, does not spin smoothly, or has any rough spots, replace it.

Oil Seal Inspection

- Inspect the oil seals.

★Replace it if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened, or been otherwise damaged.

Damper Inspection



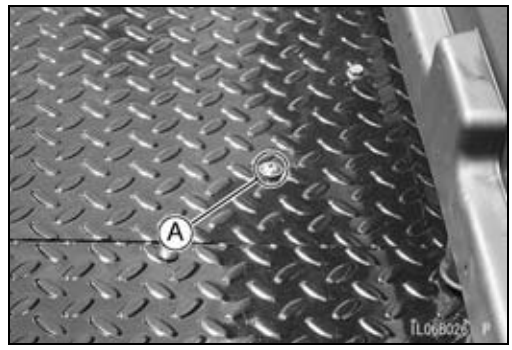
- Visually inspect the driven bevel gear [A], cam follower [B], spring [C] and shaft [D].

★Replace any part that appears damaged.

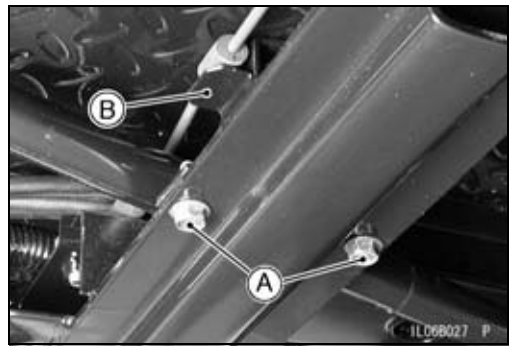
Propeller Shafts

Propeller Shaft Removal

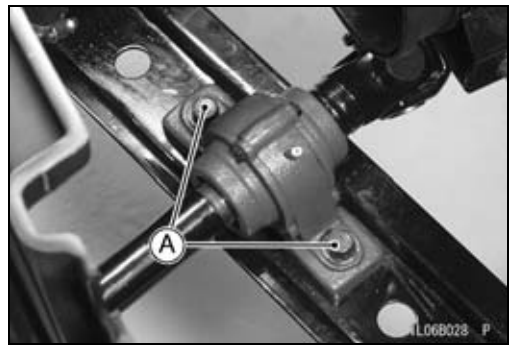
- Remove the brake pipe bracket mounting screw [A].



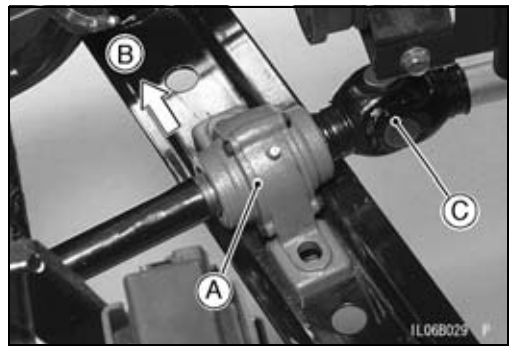
- Remove:
  Brake Pipe Bracket Mounting Bolts [A]
  Bracket [B]



- Tilt up the seat.
- Remove:
  Air Cleaner Cover (see Air Cleaner Element Cleaning in the Fuel System chapter)
  Propeller Shaft Bearing Housing Mounting Bolts [A] and Nuts
  Washers
  Collars



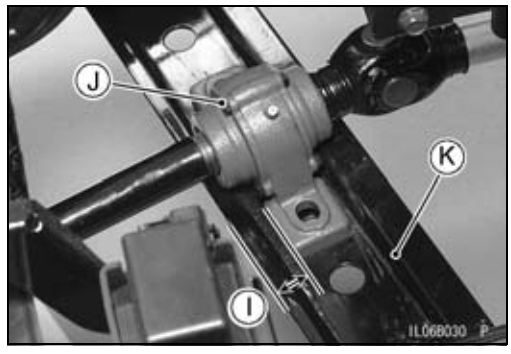
- Move the propeller shaft bearing housing [A] to the outside [B].
- Remove:
  Rear Propeller Shaft [C]
  Front Propeller Shaft



Propeller Shafts

Propeller Shaft Installation



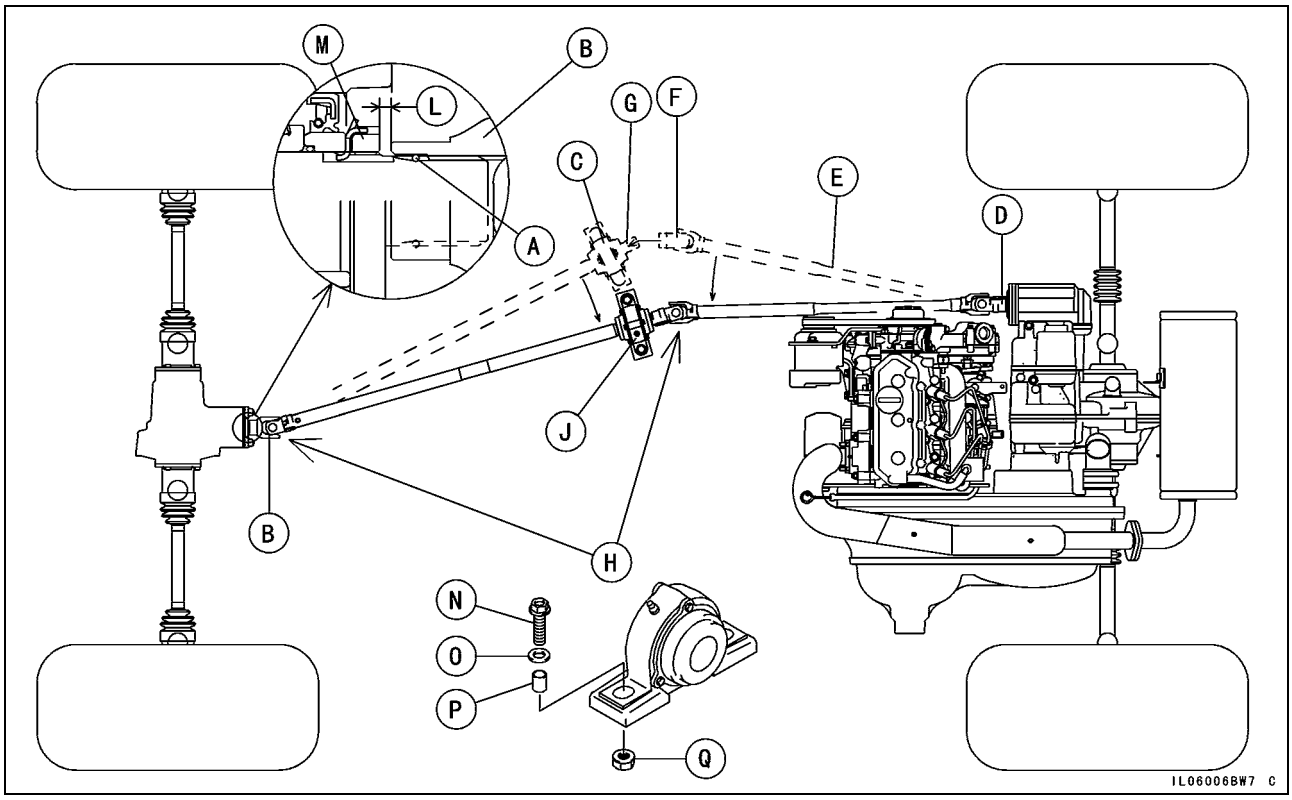


- Wipe the old grease off the splines of the propeller shafts, and grease to them.
- Inspect the propeller shafts (see Propeller Shaft Inspection).
- Apply grease to the O-ring [A] on the front pinion gear.
- Install the front propeller shaft yoke [B] on the pinion gear.
- Put the propeller shaft bearing housing [C] at fully outside position.
- Install the rear propeller shaft yoke [D] on the rear driven gear shaft so that the thin side [E] of the propeller shaft positions to the rearward.
- Install the rear propeller shaft yoke [F] on the front propeller shaft rear end [G], aligning the yoke angles [H] of the front and rear propeller shafts.
- Parallel [I] the propeller shaft bearing housing [J] with the mounting bracket [K].

○Make the 3 mm (0.12 in.) clearance [L] between the yoke [B] of the front propeller shaft and the front pinion gear nut [M].

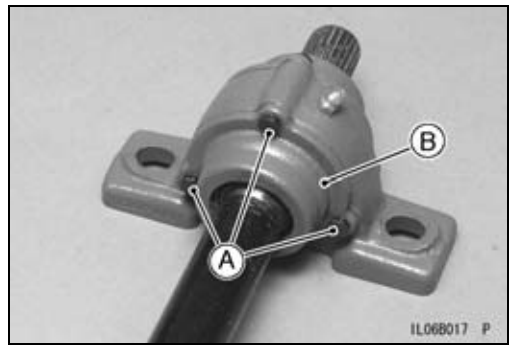
- Install:

  Propeller Shaft Bearing Housing Bolts [N]
  Washers [O]
  Collars [P]
  Nuts [Q]

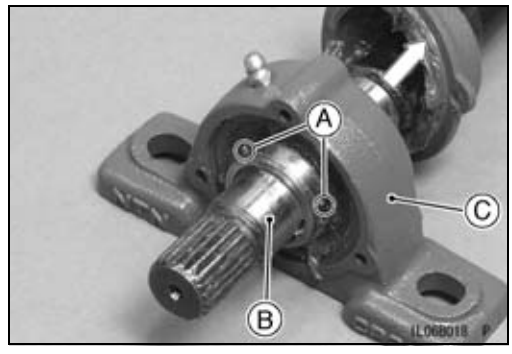


Propeller Shafts

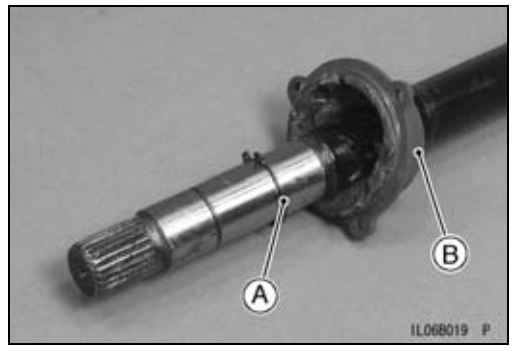
Propeller Shaft Bearing Housing Removal



- Remove:
  Front Propeller Shaft (see Propeller Shaft Removal)
  Propeller Shaft Bearing Housing Cover Bolts [A] (Both Sides)
  Propeller Shaft Bearing Housing Covers [B] (Both Sides)



- Wipe off the grease.
- Remove:
  Stop Screws [A]
  Front Propeller Shaft [B]
  Propeller Shaft Bearing Housing [C]

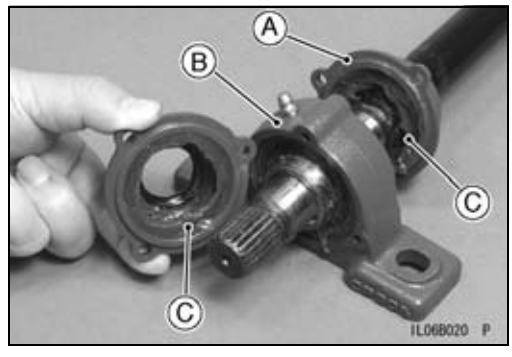


- Wipe off the grease.
- Remove the circlip [A].

Special Tool - Outside Circlip Pliers: 57001-144

- Remove the propeller shaft bearing housing cover [B].

Propeller Shaft Bearing Housing Installation



- Clean the front propeller shaft by wiping off the used grease on it.
- Install:
  Propeller Shaft Bearing Housing Cover [A]
  New Circlip

Special Tool - Outside Circlip Pliers: 57001-144

- Insert the front propeller shaft in the propeller shaft bearing housing [B].
- Tighten:

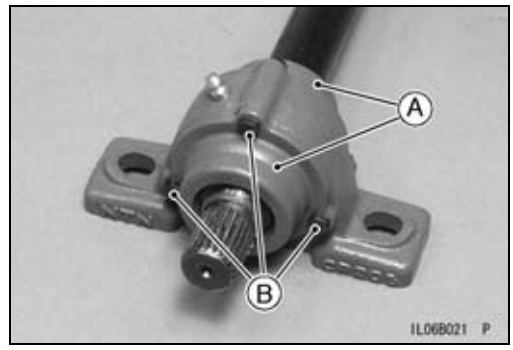
Torque - Stop Screws: 3.9 N·m (0.40 kgf·m, 35 in·lb)

- Apply grease about 8 g (0.28 oz) [C] into each cover.

Propeller Shafts

- Install:
  Propeller Shaft Bearing Housing Covers [A]
  Propeller Shaft Bearing Housing Cover Bolts [B] (Both Sides)
- Tighten:

Torque - Propeller Shaft Bearing Housing Cover Bolts: 3.4 N·m (0.35 kgf·m, 30 in·lb)

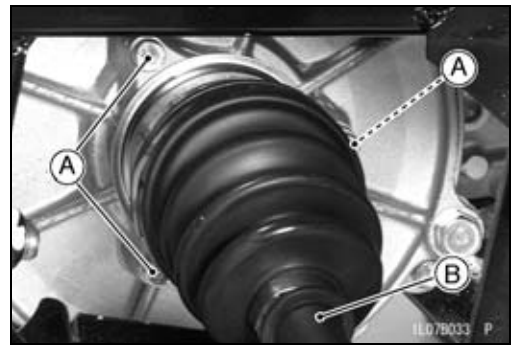


Propeller Shaft Inspection

- Visually inspect the splines of the propeller shafts.
★If they are twisted, badly worn, or chipped, replace the shafts.
- Check that the universal joint works smoothly without rattling or sticking.
★If it does not, the bearings of the joint are damaged. Replace the propeller shaft with a new one.

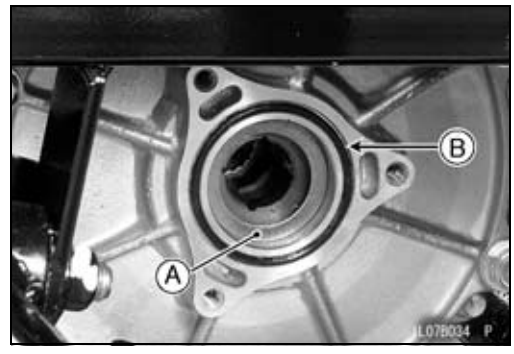
Drive Shaft and Axles

Front Axle Removal



- Remove:
  Steering Knuckle (see Steering Knuckle Removal in the Steering chapter)
  Radiator Side Cover
  Front Axle Cap Bolts [A]
  Front Axle [B]

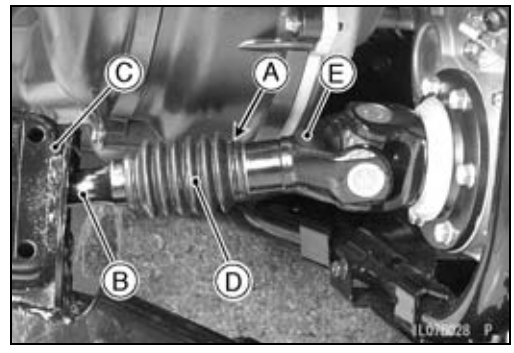
Front Axle Installation



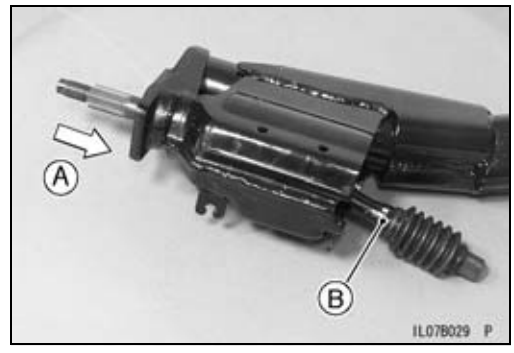
- Wipe the old grease off the splines of the axle and cap oil seal, and grease them.
- Inspect the axle (see Drive Shaft and Axle Inspection).
- Be sure to install the spacer [A] and O-ring [B] in the recess of the front final gear case.
- Tighten:

Torque - Front Axle Cap Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

Rear Drive Shaft and Axle Removal



- Remove:
  Rear Wheels (see Wheel Removal in the Wheels/Tires chapter)
  Rear Brake Drums (see Brake Drum Removal in the Brakes chapter)
  Rear Brake Panel Assemblies (with Brake Pipes and Hoses)
  Leaf Springs (see Leaf Spring Removal in the Suspension chapter)
  Rubber Bands [A]
  Axles [B] and Axle Bracket [C]
- Slide the dust boots [D] from the drive shafts [E], and pull the one of the axles from the drive shaft, and then the other axle from the shaft.

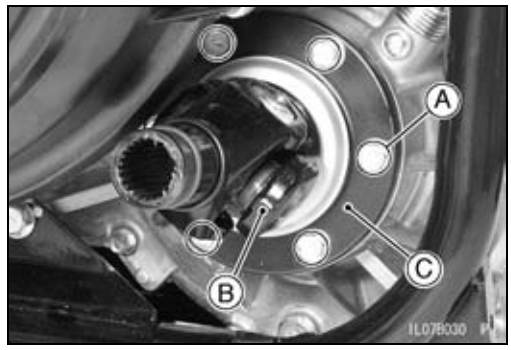


- Tap [A] the outside of the rear axle [B], and pull it out from the inside.

Drive Shaft and Axles

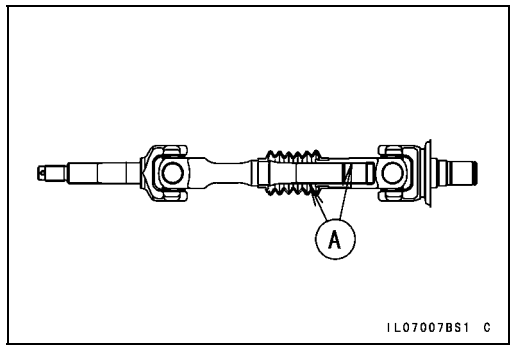
- Remove:
  Drive Shaft Cap Bolts [A]
  Drive Shaft [B] and Cap [C]

○Set the differential shift lever into the UN-LOCK position.



Rear Drive Shaft and Axle Installation

- Wipe the old grease off the splines [A] of the drive shafts, axles, and cap oil seals, and grease them.
- Inspect the drive shafts and axles (see Drive Shaft and Axle Inspection).
- Align the yoke angles of the drive shaft and axle.
- Replace the drive shaft cap gasket with a new one.



★If the dust boot was removed, install it on the axle so that the small hole [A] in the boot is toward the axle side.

- Adjust the transmission oil (see Transmission Oil Change in the Periodic Maintenance chapter).



Drive Shaft and Axle Inspection

- Visually inspect the splines of the drive shaft and axle.

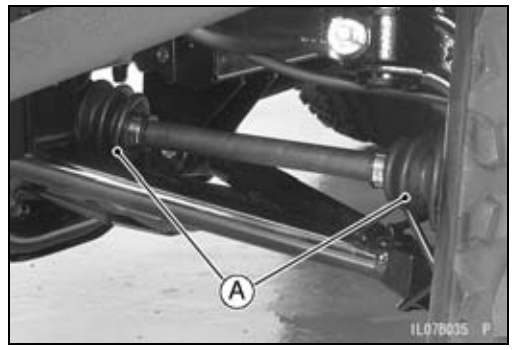
★If they are twisted, badly worn, or chipped, replace the drive shaft and/or axle with a new one.

- Check that the universal joint and/or ball joint works smoothly without rattling or sticking.

★If it does not, the bearings of the joint are damaged. Replace the drive shaft and/or axle with a new one.

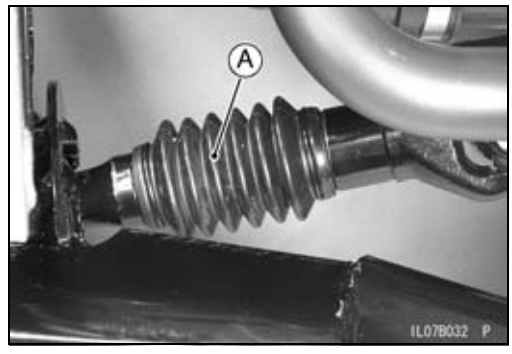
Drive Shaft and Axles

Dust Boot Inspection

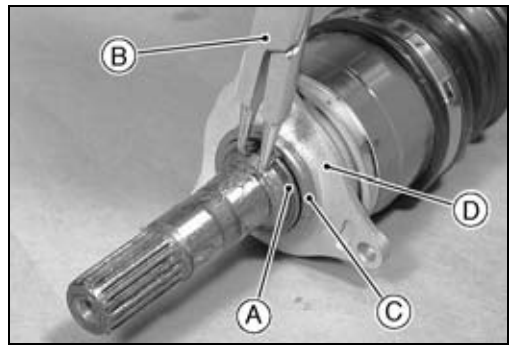


- Visually inspect the boots [A] in accordance with the Periodic Maintenance Chart or if the drive shafts or axles are noisy during operation.

★If the dust boot is torn, worn, deteriorated, or leaks grease, replace it.



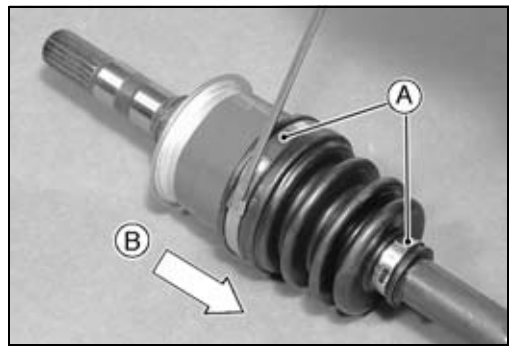
Front Axle Joint Boot Replacement



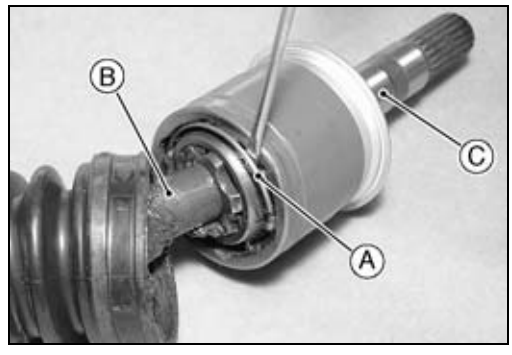
- Remove:
  Front Axle (see Front Axle Removal)
  Circlip [A]

Special Tool - Outside Circlip Pliers [B]: 57001-144

- Remove:
  Collar [C]
  Cap [D]



- Unlock the boot bands [A] for the inboard joint boot and move [B] the boot toward the outboard joint.



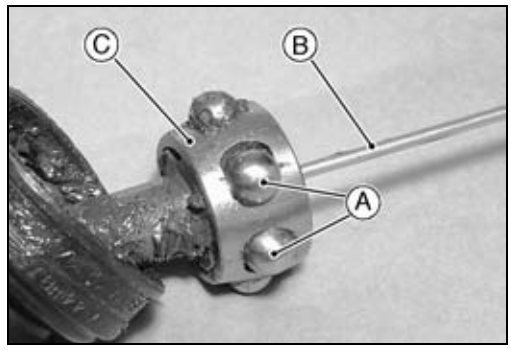
- Remove the retaining ring [A].
- Separate the outboard shaft [B] from inboard shaft [C].

Drive Shaft and Axles

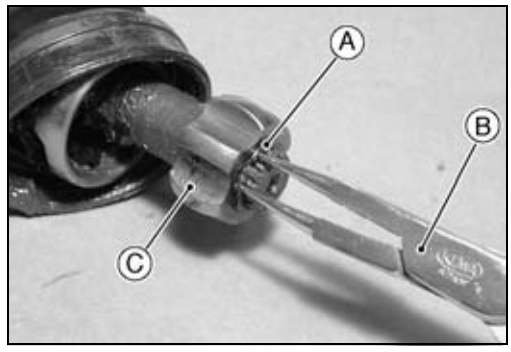
- Remove the steel balls [A] with a screwdriver [B].
- Wipe the old grease.

CAUTION
Do not reuse the old grease.

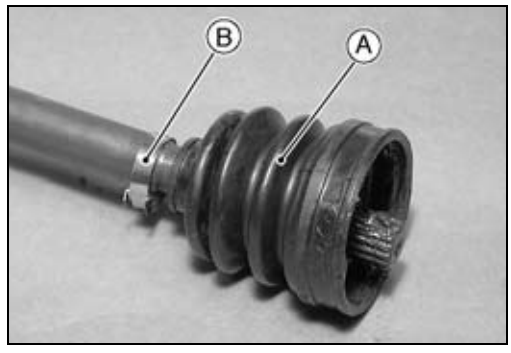
- Move the steel ball holder [C] toward the outboard joint.



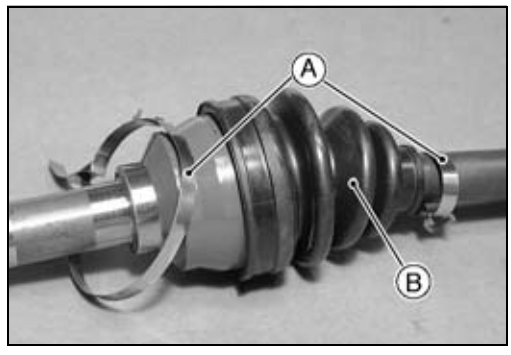
- Remove the circlip [A].
  Special Tool - Outside Circlip Pliers [B]: 57001-144
- Remove the steel ball base [C].



- Remove:
  Inboard Joint Boot [A]
  Boot Band [B]
- Wipe the old grease.



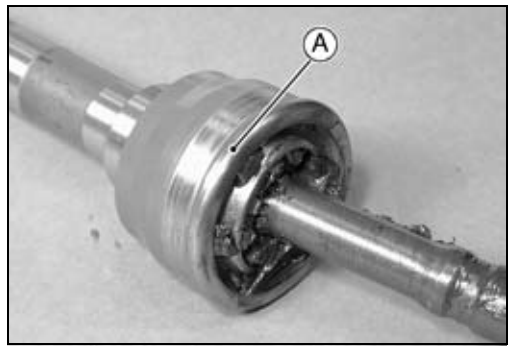
- Unlock the boot bands [A] for the outboard joint boot and remove the boot [B].



NOTE

○*The outboard joint [A] can not be disassembled.*

- Wipe the old grease.



Drive Shaft and Axles

- Check the universal joints.

★If any joint does not work smoothly without rattling or sticking, the joint bearing is damaged. Replace the axle.

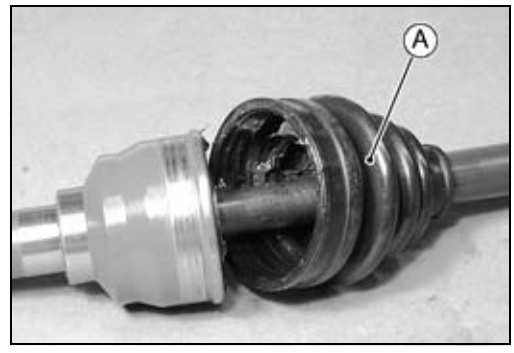
- Visually inspect the splines on the shaft.

★If they are badly worn or chipped, replace the axle.

- Clean off the joint parts.

CAUTION
Never clean the boots with mineral oil or gasoline because they will deteriorate the boot.

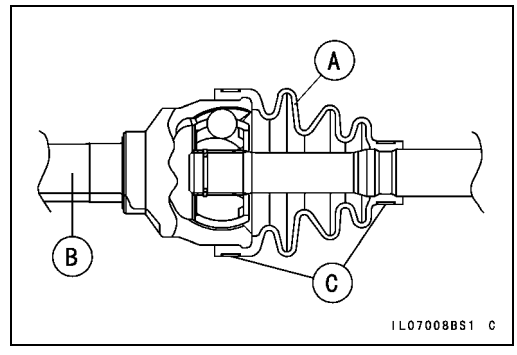
- Replace the following parts with new ones.
  Joint Boots
  Circlip
  Boot Bands
- Install the outboard joint boot [A].
- Pack the outboard joint with 40 ±10 g (1.4 ±0.4 oz) of the special grease.

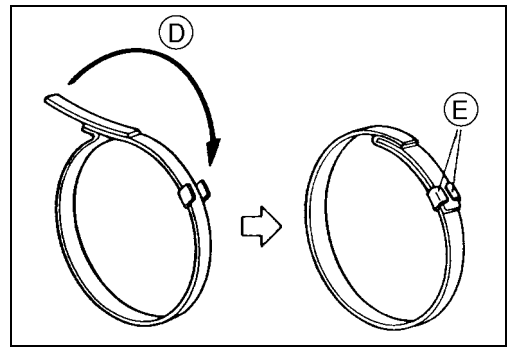


CAUTION
Be sure to use the special grease in the boot set.

○Pour the grease in the outboard boot 1/3 ~ 1/2 the capacity of the boot.

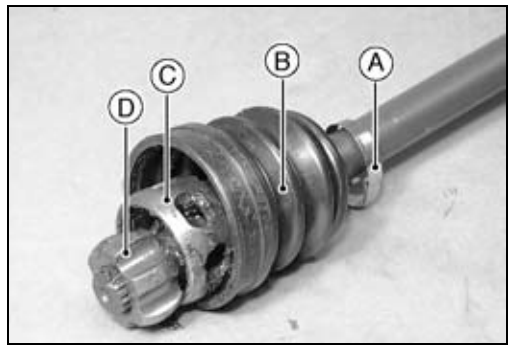
- Install the outboard boot [A] on the outboard joint and shaft [B] properly as shown in the figure.
- Clamp the boot bands [C] and bend [D] the tangs [E] securely to hold down the end of the band.



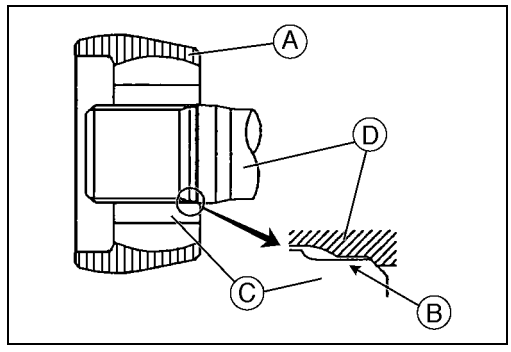


Drive Shaft and Axles

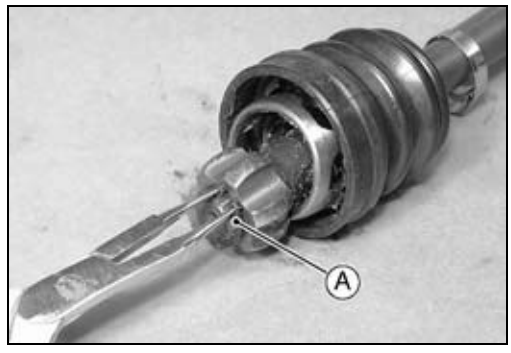
● Install:
Small Boot Band [A]
Inboard Boot [B]
Steel Ball Holder [C]
Steel Ball Base [D]



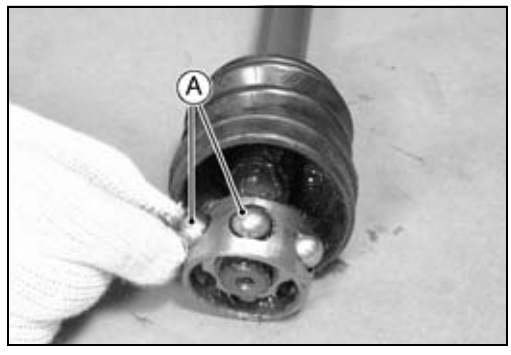
○Install the steel ball holder [A] as shown in the figure.
○Face the chamfered side [B] of the steel ball base [C] to the boot.
Outboard Shaft [D]



● Install the circlip [A].
Special Tool - Outside Circlip Pliers: 57001-144



● Align the recesses of the steel ball base and holes in the steel holder, and install the steel balls [A].

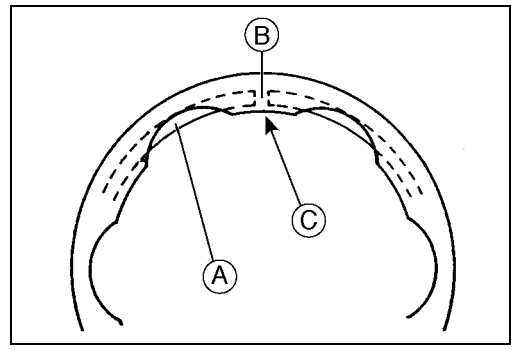


● Pack the inboard joint with 35 ±10 g (1.2 ±0.4 oz) of the special grease.
○Pour the special grease in the outboard shaft housing [A] about 25 g (0.9 oz).

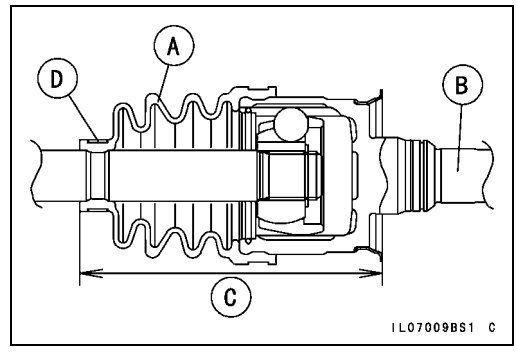


Drive Shaft and Axles

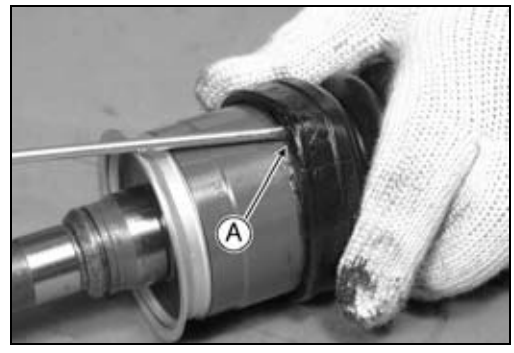
- Install the retaining ring [A] so that the opening [B] is aligned with one of the projections [C].



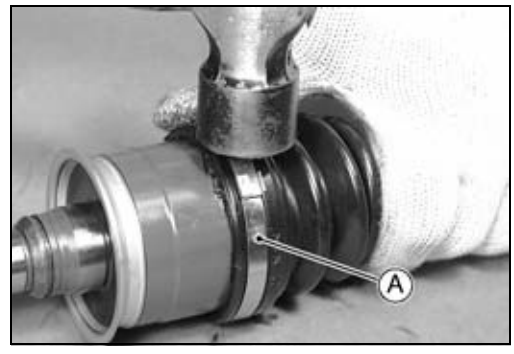
- Install the inboard boot [A] on the outboard joint and shaft [B] properly as shown in the figure.
  119 mm (4.69 in.) [C]
- Clamp the small boot band [D] and bend the tang securely to hold down the end of the band.



- Slightly open [A] the larger diameter end of the joint boot to equalize the air pressure inside the boot.



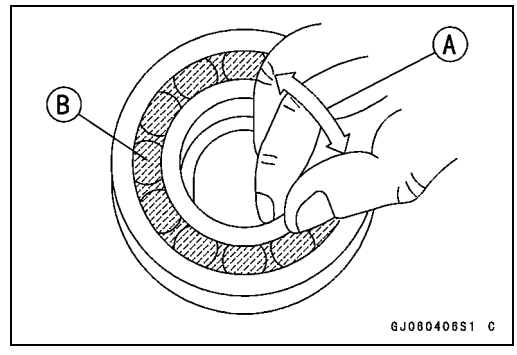
- Clamp the large boot band [A] and bend the tang securely to hold down the end of the band.



Ball Bearing Inspection

- Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high-flash point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.
- Spin [A] the bearing by hand to check its condition.

★If the bearing [B] is noisy, does not spin smoothly, or has any rough spots, replace it.



Drive Shaft and Axles

Grease Seal Inspection

- Visually inspect the grease seals.

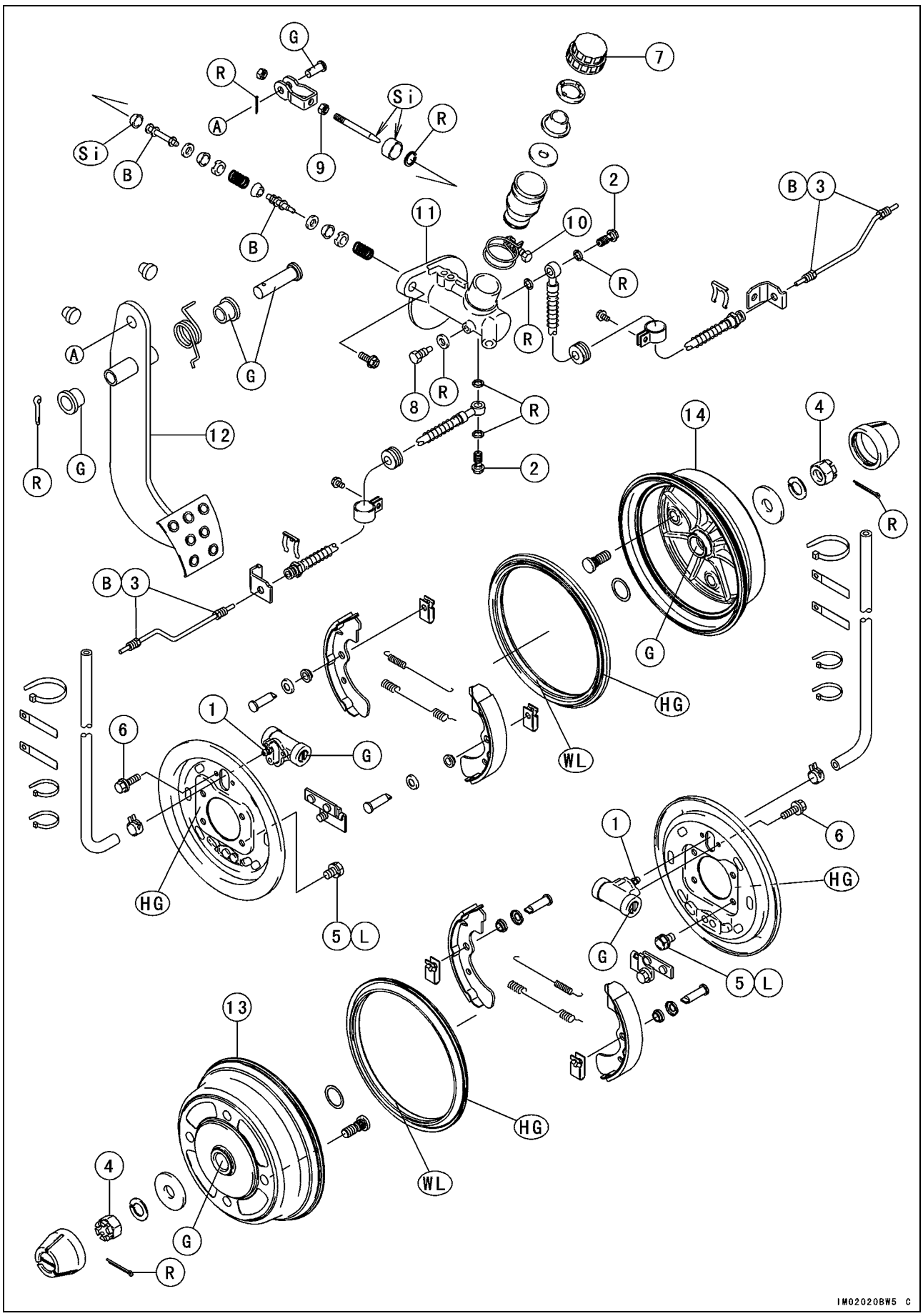
★Replace if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened, or been otherwise damage.

Brakes

Table of Contents

Exploded View 13-2
Specifications 13-6
Special Tools 13-7
Brake Fluid 13-8
  Brake Fluid Recommendation 13-8
  Brake Fluid Level Inspection 13-8
  Brake Fluid Change 13-8
  Brake Line Air Bleeding 13-8
Brake Pedal and Master Cylinder 13-10
  Brake Pedal Play Inspection 13-10
  Master Cylinder Removal 13-10
  Master Cylinder Installation 13-10
  Master Cylinder Disassembly/Assembly 13-10
  Master Cylinder Inspection 13-11
Brake Hoses and Pipes 13-12
  Brake Hose and Pipe Inspection 13-12
  Brake Hose and Pipe Replacement 13-12
Brake Drums 13-13
  Brake Drum Removal 13-13
  Brake Drum Installation 13-13
  Brake Drum Wear 13-14
Brake Panel Assemblies 13-15
  Brake Panel Assy Removal 13-15
  Brake Panel Assy Installation 13-16
  Brake Panel Disassembly 13-16
  Brake Panel Assembly 13-18
  Wheel Cylinder Removal/Installation 13-20
  Wheel Cylinder Assembly 13-20
  Wheel Cylinder Inspection 13-21
  Brake Shoe Lining Wear 13-21
  Brake Shoe Spring Inspection 13-21
  Grease Seal Replacement 13-22
Parking Brake Lever and Cables 13-23
  Parking Brake Lever Travel Adjustment 13-23
  Parking Brake Cable Lubrication/Inspection 13-23

Exploded View



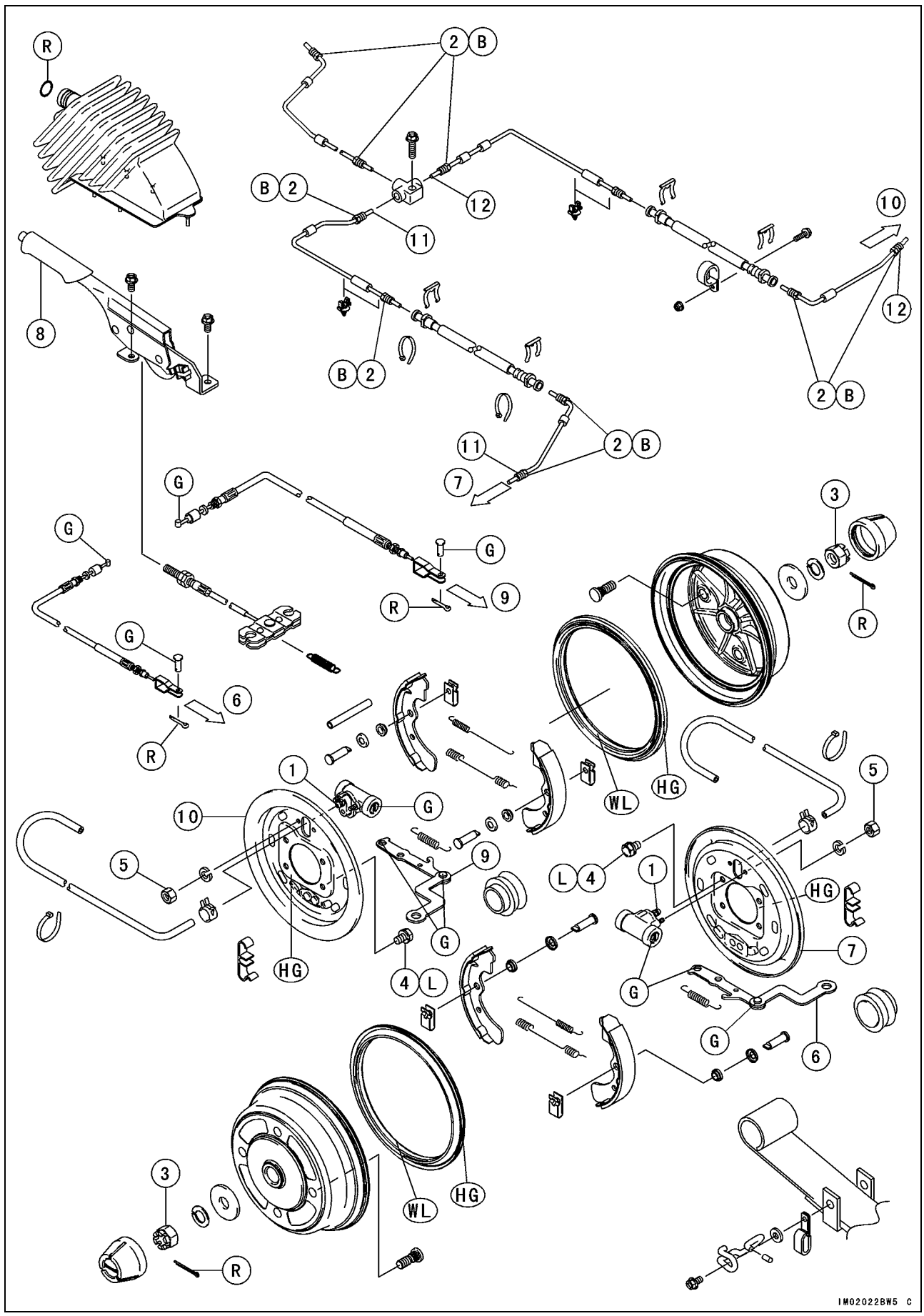
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Bleed Valves	5.4	0.55	48 in·lb	
2	Brake Hose Banjo Bolts	25	2.5	18	
3	Brake Pipe Nipples	18	1.8	13	B
4	Front Axle Nuts	196	20.0	145	
5	Front Brake Panel Mounting Bolts	44	4.5	32	L
6	Front Wheel Cylinder Mounting Bolts	10.3	1.1	91 in·lb	
7	Master Cylinder Reservoir Cap	3.4	0.35	30 in·lb	
8	Piston Stop Bolt	8.8	0.90	78 in·lb	
9	Push Rod Locknut	17.2	1.8	13	
10	Reservoir Clamp Bolt	6.1	0.62	54 in·lb	

11. Brake Master Cylinder
12. Brake Pedal
13. Left Front Brake Drum
14. Right Front Brake Drum

B: Apply brake fluid.
G: Apply grease.
HG: Apply high-temperature grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
Si: Apply silicone grease.
WL: Apply soap and water solution or rubber lubricant.

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Bleed Valves	5.4	0.55	48 in·lb	
2	Brake Pipe Nipples	18	1.8	13	B
3	Rear Axle Nuts	304	31.0	224	
4	Rear Brake Panel Mounting Bolts	44	4.5	32	L
5	Rear Wheel Cylinder Mounting Nuts	7.4	0.75	65 in·lb	

6. Left Parking Brake Lever Linkage
7. Left Rear Brake Drum
8. Parking Brake Lever
9. Right Parking Brake Lever Linkage
10. Right Rear Brake Drum
11. White Mark
12. Yellow Mark

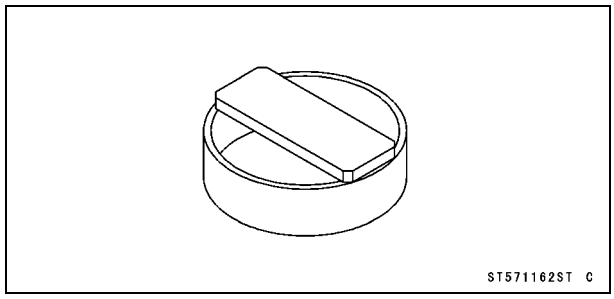
B: Apply brake fluid.
G: Apply grease.
HG: Apply high-temperature grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
WL: Apply soap and water solution or rubber lubricant.

Specifications

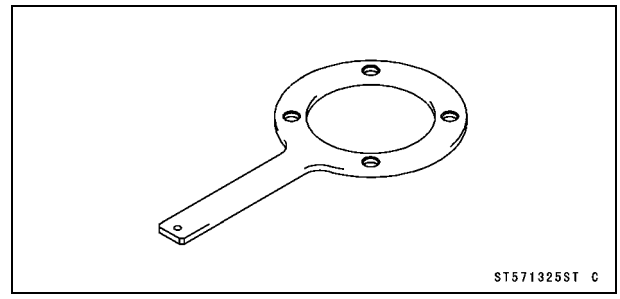
Item	Standard	Service Limit
Brake Fluid		
Type	DOT3	– – –
Fluid Level	Between upper and lower level lines	– – –
Brake Pedal		
Brake Pedal Free Play	2 ~ 10 mm (0.08 ~ 0.39 in.)	– – –
Brake Drums		
Brake Drum Inside Diameter	180.000 ~ 180.160 mm (7.0866 ~ 7.0929 in.)	180.75 mm (7.116 in.)
Brake Panel Assemblies		
Brake Shoe Lining Thickness	4.5 mm (0.18 in.)	1.0 mm (0.04 in.)
Parking Brake Lever and Cables		
Parking Brake Lever Travel	8 ~ 12 notches (clicks) at 200 N (20 kgf, 44 lb)	– – –

Special Tools

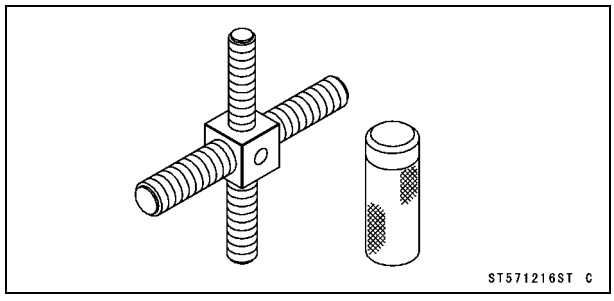
Clutch Spring Compressor:
57001-1162



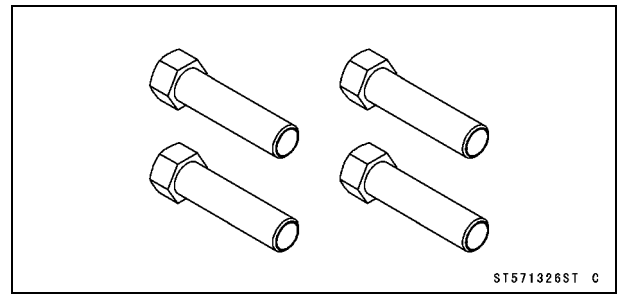
Brake Drum Holder:
57001-1325



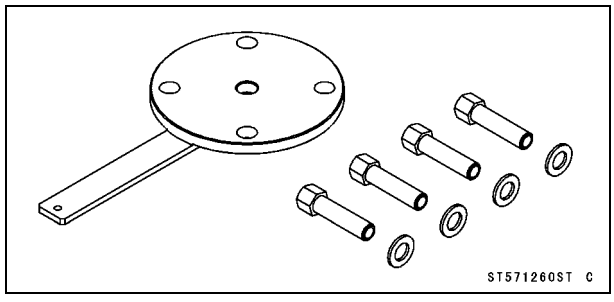
Rotor Puller, M16/M18/M20/M22 × 1.5:
57001-1216



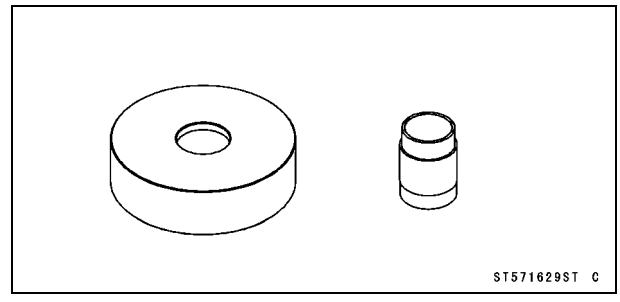
Brake Drum Remover Nuts:
57001-1326



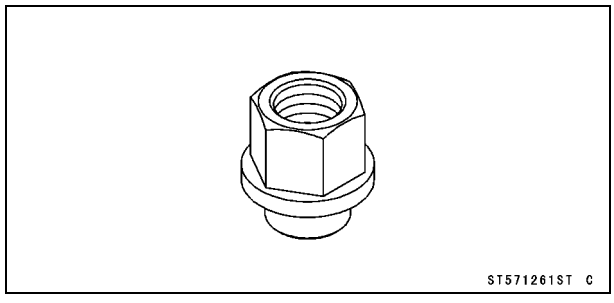
Brake Drum Remover:
57001-1260



Grease Seal Driver Set:
57001-1629



Brake Drum Pusher, M18 × 1.5:
57001-1261



Brake Fluid

Brake Fluid Recommendation

- Use extra heavy-duty brake fluid only from a container marked DOT3.

Recommended Brake Fluid
Type: DOT3

⚠ WARNING

Never reuse old brake fluid.
Do not use fluid from a container that has been left unsealed or that has been open for a long time.
Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.
Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.
Don't add or change the fluid in the rain or when a strong wind is blowing.
If any of the brake line fittings or the bleed valve is opened at any time, the AIR MUST BE BLED FROM THE BRAKE LINE.

CAUTION

Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.

Brake Fluid Level Inspection

- Refer to the Brake Fluid Level Inspection in the Periodic Maintenance chapter.

Brake Fluid Change

- Refer to the Brake Fluid Change in the Periodic Maintenance chapter.

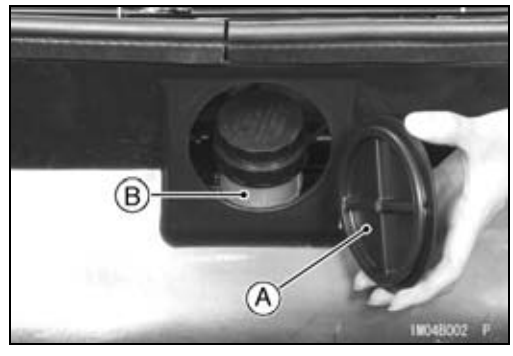
Brake Line Air Bleeding

- Tilt up the front cargo hood and remove the maintenance cover [A].
- Level the reservoir [B] and check that there is plenty of fluid in the reservoir.

NOTE

○*The fluid level must be checked several times during the bleeding operation and replenished as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.*

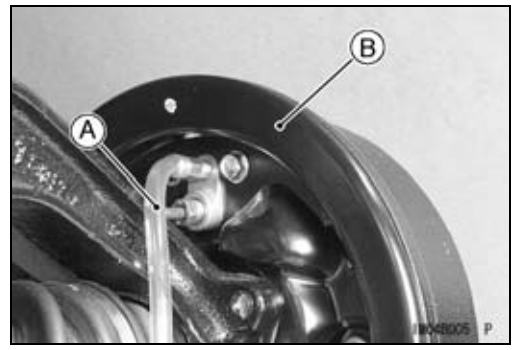
- With the reservoir cap off, slowly pump the brake pedal several times until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir. This bleeds the air from the master cylinder end of the line.



Brake Fluid

- Remove the wheel for extra clearance (see Wheel Removal in the Wheels/Tires chapter).
- Connect a clear plastic hose [A] to the bleed valve at the wheel cylinder, and run the other end of the hose into a container.

Brake Panel [B]



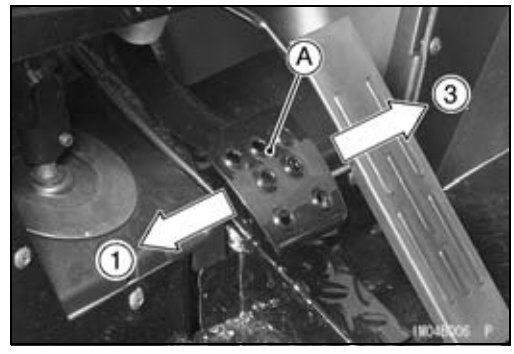
NOTE

○*Start with the rear left or right wheel and finish with the front left or right wheel.*

- Bleed the brake line and the caliper as follows.

○Repeat this operation until no more air can be seen coming out into the plastic hose.

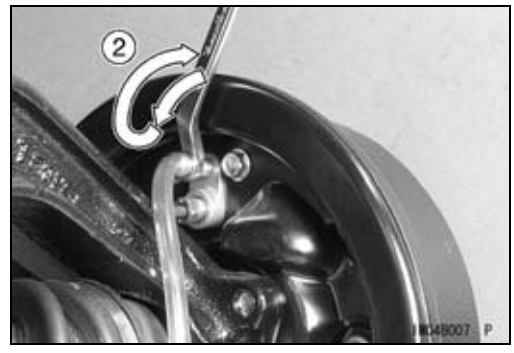
1. Pump the brake pedal [A] until it becomes hard, and apply the brake pedal and hold it.
2. Quickly open and close the bleed valve while holding the brake pedal applied.
3. Release the brake pedal.



- Tighten:

Torque - Bleed Valves: 5.4 N·m (0.55 kgf·m, 48 in·lb)

- Repeat the previous step for each wheel.
- When air bleeding is finished, add fluid up to the upper level in the reservoir.
- Apply the brake forcefully for a few seconds, and check for fluid leakage around the fittings.
- Install the removed parts (see appropriate chapters).



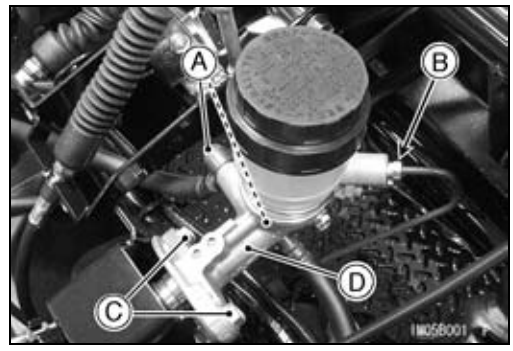
Torque - Master Cylinder Reservoir Cap: 3.4 N·m (0.35 kgf·m, 30 in·lb)

Brake Pedal and Master Cylinder

Brake Pedal Play Inspection

- Refer to the Brake Pedal Play Inspection in the Periodic Maintenance chapter.

Master Cylinder Removal



- Remove:
  Front Cargo Compartment (see Front Cargo Compartment Removal in the Frame chapter)
  Brake Hose Banjo Bolts [A]
  Brake Pipe Nipple [B] (Unscrew)
- Immediately wipe up any brake fluid that spills.

CAUTION

Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.

- Remove:
  Master Cylinder Mounting Bolts [C]
  Master Cylinder [D]

Master Cylinder Installation

- Use a new flat washer on each side of the brake hose fitting.
- Apply brake fluid to the threads of the brake pipe nipple.
- Tighten:

Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Brake Pipe Nipples: 18 N·m (1.8 kgf·m, 13 ft·lb)

- Bleed the brake line after master cylinder installation.
- Adjust the brake pedal play (see Brake Pedal Play Inspection in the Periodic Maintenance chapter).
- Check that the brake line has proper fluid pressure and no fluid leakage.

Master Cylinder Disassembly/Assembly

- Refer to the Brake Master Cylinder Cup and Dust Seal Replacement in the Periodic Maintenance chapter.

Brake Pedal and Master Cylinder

Master Cylinder Inspection

- Disassemble the master cylinder (see Brake Master Cylinder Cup and Dust Seal Replacement in the Periodic Maintenance chapter).
- Check that there are no scratches, rust or pitting on the inside of the cylinder [A] and on the outside of the pistons [B].

★If the cylinder or piston shows any damage, replace them.

- Inspect the primary cups [C] and secondary cups [D].

★If a cup is worn, damaged, softened (rotted), or swollen, replace it.

★If fluid leakage is noted at the brake push rod, the secondary cup of the rear piston should be replaced.

- Check the dust cover [E] for damage.

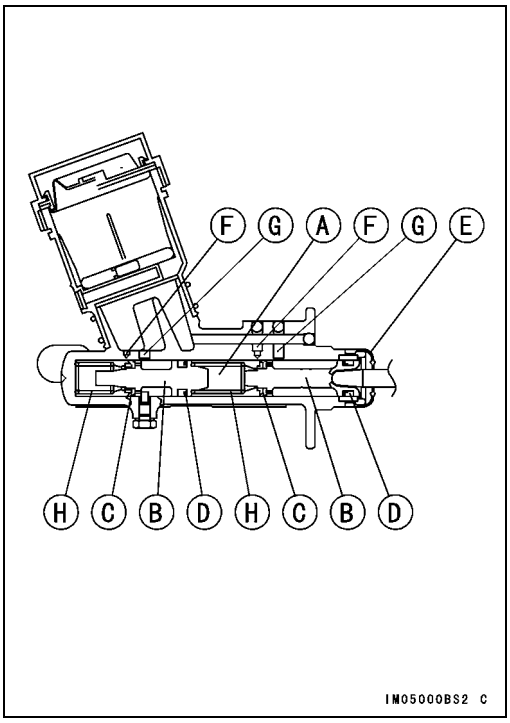
★If it is damaged, replace it.

- Check that the relief [F] and supply [G] ports are not plugged.

★If the small relief port becomes plugged, the brake shoes will drag on the drum. Blow the ports clean with compressed air.

- Check the piston return springs [H] for any damage.

★If the spring is damaged, replace it.



Brake Hoses and Pipes

Brake Hose and Pipe Inspection

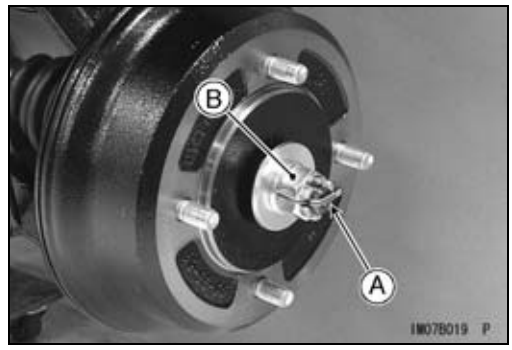
- Refer to the Brake Hose and Pipe Inspection in the Periodic Maintenance chapter.

Brake Hose and Pipe Replacement

- Refer to the Brake Hose and Pipe Replacement in the Periodic Maintenance chapter.

Brake Drums

Brake Drum Removal



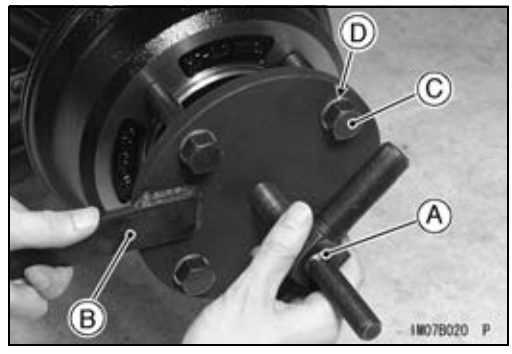
● Remove:
Wheel (see Wheel Removal in the Wheels/Tires chapter)
Cotter Pin [A]
Axle Nut [B]

○Loosen the axle nut, while applying the brake, and release the brake.

○You can also loosen the axle nut, using the brake drum holder (special tool).

Special Tool - Brake Drum Holder: 57001-1325

● Be sure to release the parking brake when removing the rear brake drum.



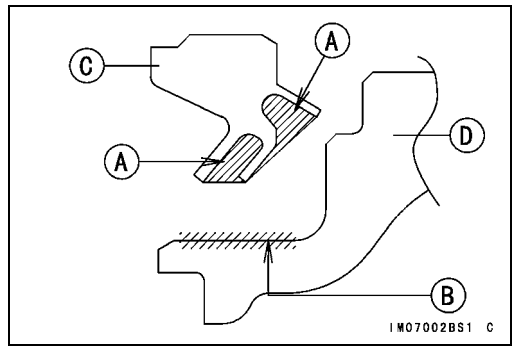
● The brake drums are press-fitted on the axles. Use the brake drum remover set and rotor puller (special tools) to remove the drums.

○Mount the brake drum remover on the drum studs with the remover nuts and washers (parts in the remover set).

Special Tools - Rotor Puller, M16/M18/M20/M22 × 1.5 [A]: 57001-1216
Brake Drum Remover [B]: 57001-1260
Brake Drum Remover Nuts [C]: 57001-1326
Washers [D] (57001-1260)

○Do not remove the drum bolts. If a drum bolt is damaged, replace the drum.

Brake Drum Installation



● Apply high-temperature grease (Amoco Rykon Premium Grease No. 2 EP Green) to the brake drum grease seal lips [A] and inside [B] of the drum as shown in the figure.
Grease Seal [C]
Brake Drum [D]



● Install:
Collar [A] (Rear Brake only)
Brake Drum

Brake Drums

- Mount the brake drum holder [A] securely on the drum studs with the wheel nuts.

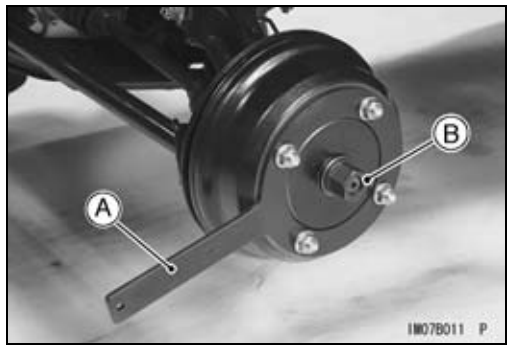
  Special Tool - Brake Drum Holder: 57001-1325

- Using the brake drum pusher [B], and tighten it until the pusher stops.

  Special Tool - Brake Drum Pusher, M18 × 1.5: 57001-1261

- And then remove the pusher, install the washer and axle nut.
- Tighten:

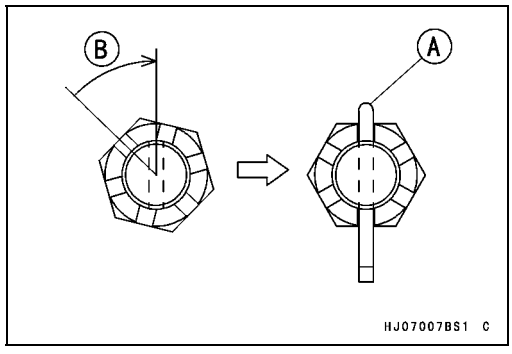
  Torque - Front Axle Nuts: 196 N·m (20.0 kgf·m, 145 ft·lb)
  Rear Axle Nuts: 304 N·m (31.0 kgf·m, 224 ft·lb)



- Insert a new cotter pin [A].

NOTE

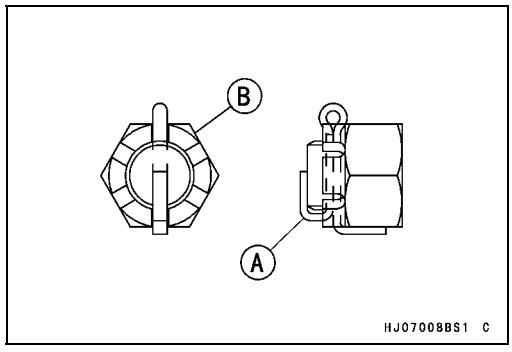
○When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle shaft, tighten the nut clockwise [B] up to next alignment.
○It should be within 30°.
○Loosen once and tighten again when the slot goes past the nearest hole.



- Bend the cotter pin [A] over the nut [B].

⚠ WARNING

If the rear axle nut is not securely tightened or the cotter pin is not installed, an unsafe riding condition may result.



Brake Drum Wear

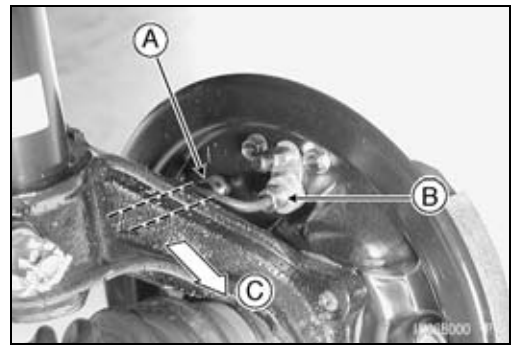
- Refer to the Brake Wear Inspection in the Periodic Maintenance chapter.

Brake Panel Assemblies

Brake Panel Assy Removal

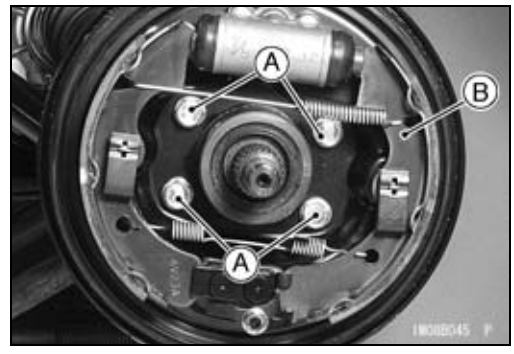
(Front Brake Panel)

- Remove:
  Front Brake Drum (see Brake Drum Removal)
  Brake Hose Retainer
  Breather Hose [A]
  Brake Pipe Nipple [B]
  Front [C]
- Immediately wipe up any brake fluid that spills.



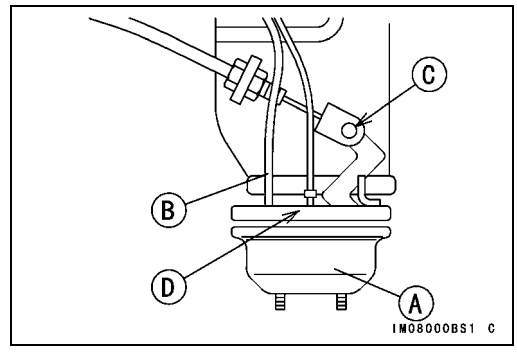
CAUTION
Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.

- Remove the brake panel mounting bolts [A], and then remove the brake panel assy [B].



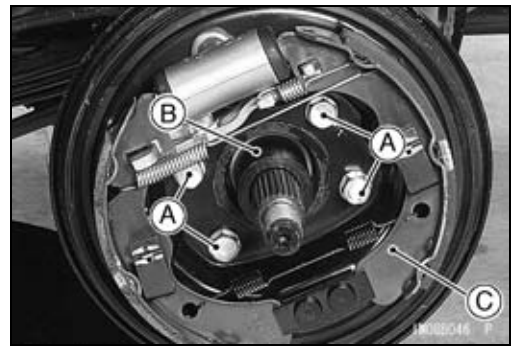
(Rear Brake Panel)

- Remove:
  Rear Brake Drum [A] (see Brake Drum Removal)
  Brake Hose Retainer
  Breather Hose [B]
  Cotter Pin and Joint Pin [C]
  Brake Pipe Nipple [D] (Unscrew)
- Immediately wipe up any brake fluid that spills.



CAUTION
Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.

- Remove the brake panel mounting bolts [A] and collar [B], and then remove the brake panel assy [C].



Brake Panel Assemblies

Brake Panel Assy Installation

- Apply high-temperature grease (Amoco Rykon Premium Grease No. 2 EP Green) to the following portion.
  Brake Panel Seating Surface (Between Axle and Panel)
- Install the brake panel assy.
- Apply a non-permanent locking agent to the threads of the brake panel mounting bolts.

Torque - Front/Rear Brake Panel Mounting Bolts: 44 N·m (4.5 kgf·m, 32 ft·lb)

- Apply brake fluid to the threads of the brake pipe nipple and tighten it.

Torque - Brake Pipe Nipples: 18 N·m (1.8 kgf·m, 13 ft·lb)

- Install the brake hose retainer.
- Bleed the brake line after brake drum installation (see Brake Line Air Bleeding).
- Be sure to check the brake system for good braking power, no brake drag, and no fluid leakage.

⚠ WARNING

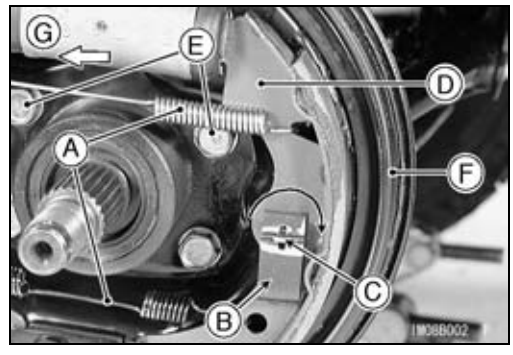
Do not attempt to drive the vehicle until a full brake pedal is obtained. Pump the brake pedal until the wheel cylinders operate and the brake shoes are against the drums. The brake will not function on the first application of the pedal if this is not done.

- Inspect the parking brake lever inspection (see Parking Brake Lever Inspection in the Periodic Maintenance chapter).

Brake Panel Disassembly

(Front Brake Panel)

- Remove:
  Front Brake Drum (see Brake Drum Removal)
  Brake Pipe Nipple and Vent Hose (see Brake Panel Assy Removal)
- Remove the brake shoe springs [A].
- While pushing the shoe hold-down spring [B], turn the pin [C] 90° and remove the shoes [D] individually.



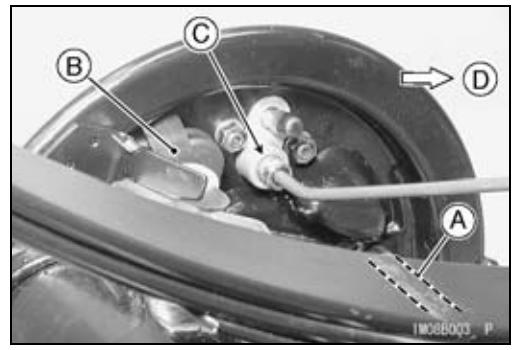
NOTE

○*Wrap the brake shoes with a clean cloth to protect the linings from grease or dirt.*

- Remove the brake panel mounting bolts [E], and then remove the brake panel [F].
  Front [G]

Brake Panel Assemblies

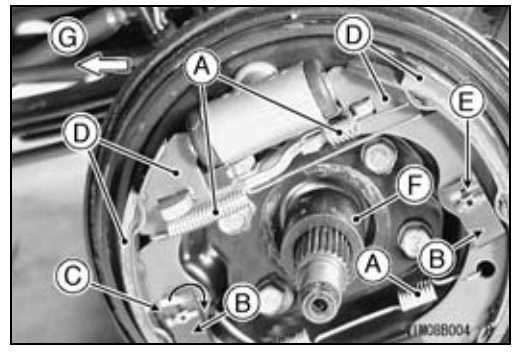
(Rear Brake Panel)



- Remove:
  Rear Brake Drum (see Brake Drum Removal)
  Vent Hose [A]
  Grommet [B] of Parking Brake Lever Linkage
  Brake Pipe Nipple [C] (Unscrew)
  Front [D]
- Immediately wipe up any brake fluid that spills.

CAUTION

Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.



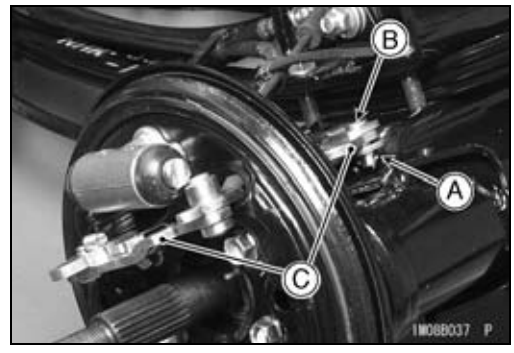
- Remove the brake shoe springs [A].
- While pushing the shoe hold-down spring [B], turn the pin [C] 90° and remove the shoes [D] individually.

NOTE

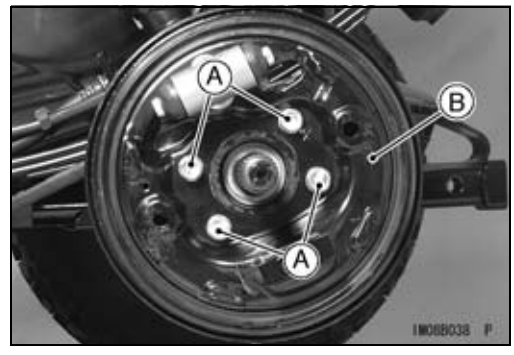
○*Wrap the brake shoes with a clean cloth to protect the linings from grease or dirt.*

○To prevent the rear pin [E] from dropping into the rear axle bracket, tape the pin onto the brake panel.

- Remove the collar [F] on the rear brake panel.
  Front [G]



- Remove the following for rear brake panel removal.
  Cotter Pin [A]
  Joint Pin [B]
  Parking Brake Lever Linkage [C]



- Remove:
  Brake Panel Mounting Bolts [A]
  Rear Brake Panel [B]

Brake Panel Assemblies

Brake Panel Assembly

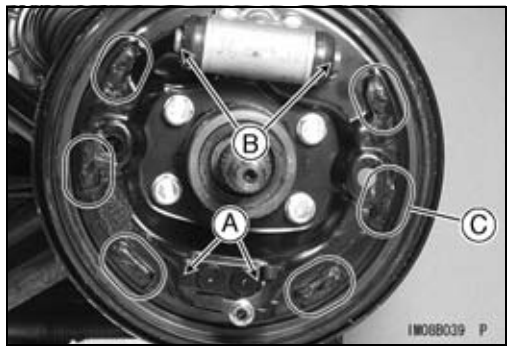
(Front Brake Panel)

- Apply high-temperature grease (Amoco Rykon Premium Grease No. 2 Green) to the following portion.
  Brake Panel Seating Surface (Between Axle and Panel)
- Install the brake panel and wheel cylinder.
- Apply a non-permanent locking agent to the threads of the brake panel mounting bolts.
- Tighten:

Torque - Front Brake Panel Mounting Bolts: 44 N·m (4.5 kgf·m, 32 ft·lb)
Front Wheel Cylinder Mounting Bolts: 10.3 N·m (1.1 kgf·m, 91 in·lb)

- Apply grease to the following portions.
  Contact Points [A] of Brake Panel and Brake Shoes
  Wheel Cylinder Piston Ends [B]
  Brake Shoe Anchor Ends [C]
- Apply brake fluid to the threads of the brake pipe nipple and tighten it.

Torque - Brake Pipe Nipples: 18 N·m (1.8 kgf·m, 13 ft·lb)



○The wheel cylinder has a brake shoe clearance adjuster.

- Turn [A] either end of the cylinder fully while holding the other end [B]. Both ends are put into the cylinder.
- Install the brake shoe springs on the original positions (see Brake Shoe Spring Inspection).



(Rear Brake Panel)

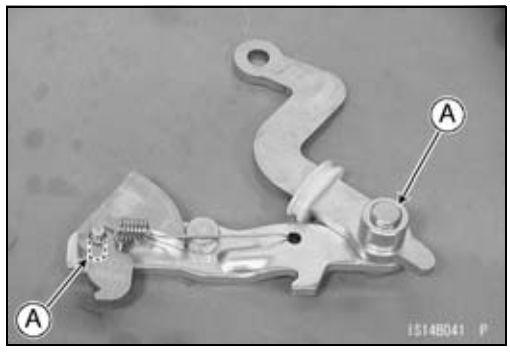
- Apply high-temperature grease (Amoco Rykon Premium Gease No. 2 EP Green) to the following portion.
  Brake Panel Seating Surface (Between Axle and Panel)
- Install the brake panel and wheel cylinder.
- Apply grease to the shoe clearance adjuster pivots [A].
- Apply a non-permanent locking agent to the threads of the brake panel mounting bolts.
- Tighten:

Torque - Rear Brake Panel Mounting Bolts: 44 N·m (4.5 kgf·m, 32 ft·lb)
Rear Wheel Cylinder Mounting Nuts: 7.4 N·m (0.75 kgf·m, 65 in·lb)

- Apply brake fluid to the thread of the brake pipe nipple and tighten it.

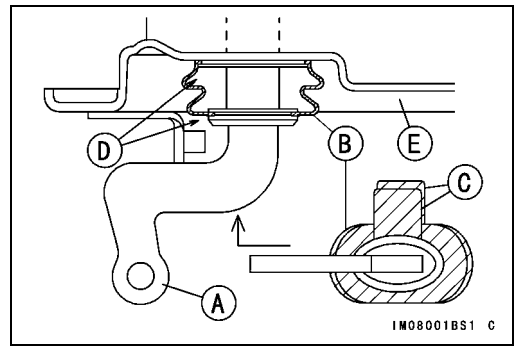
Torque - Brake Pipe Nipples: 18 N·m (1.8 kgf·m, 13 ft·lb)

- Apply grease to the following portions (refer to front brake above).
  Contact Points of Brake Panel and Brake Shoes
  Wheel Cylinder Piston Ends
  Brake Shoe Anchor Ends



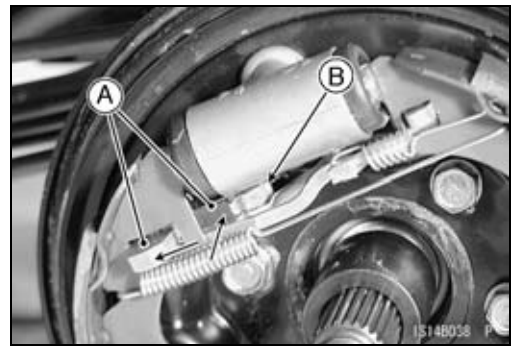
Brake Panel Assemblies

- Install the parking brake lever linkage [A] and the grommet [B] with the tabs [C] up.
- Fit the lips [D] of the grommet as shown in the figure.
  Brake Panel [E] (top view of the left rear)
- Install the brake shoe springs on the original positions (see Brake Shoe Spring Inspection).

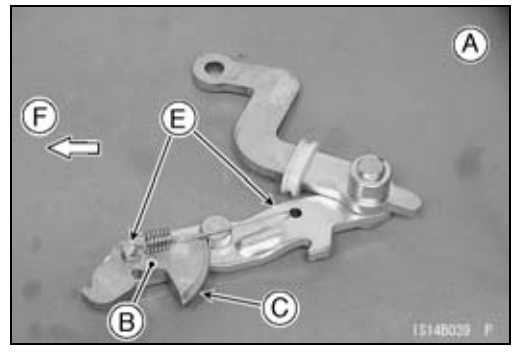


○The parking brake lever linkage has a brake shoe clearance adjuster.

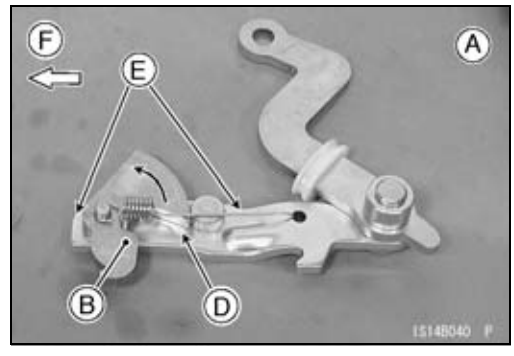
- Push the ratchet [A] forward and then in to reset the shoe clearance adjuster from the protruding position to its original position. The stop [B] sets the position.



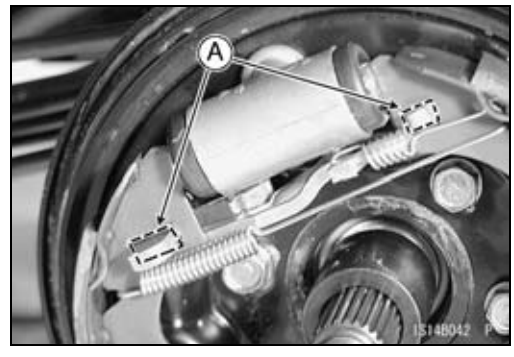
Left Parking Brake Lever Linkage [A] of Rear Brake
Ratchet [B]
Protruding Position [C]
Shoe Clearance Adjuster [E]
Front [F]



Left Parking Brake Lever Linkage [A] of Rear Brake
Ratchet [B]
Original Position [D]
Shoe Clearance Adjuster [E]
Front [F]



- Pack gaps [A] with grease sparingly.
- Install the brake shoe springs on the original positions (see Brake Shoe Spring Inspection).



Brake Panel Assemblies

(Front and Rear Brake Panels)
- Bleed the brake line after drum installation (see Brake Line Air Bleeding).
- Be sure to check the brake system for good braking power, no brake drag and no fluid leakage.

⚠ WARNING

Do not attempt to drive the vehicle until a full brake pedal is obtained. Pump the brake pedal until the wheel cylinders operate and the brake shoes are against the drums. The brake will not function on the first application of the pedal if this is not done.

- Inspect the parking brake lever inspection (see Parking Brake Lever Inspection in the Periodic Maintenance chapter).

Wheel Cylinder Removal/Installation
- Refer to the Brake Wheel Cylinder Assembly Replacement in the Periodic Maintenance chapter.

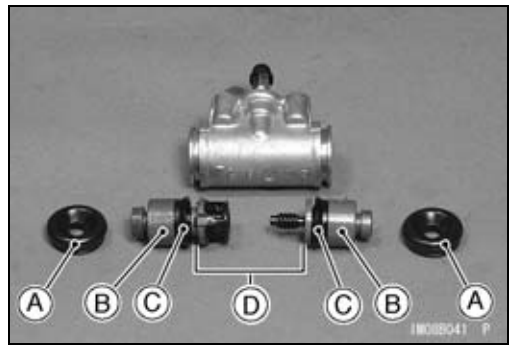
Wheel Cylinder Assembly
- Before assembly, clean all parts including the wheel cylinder with brake fluid or alcohol, and apply brake fluid to the removed parts and the inner wall of the cylinder.

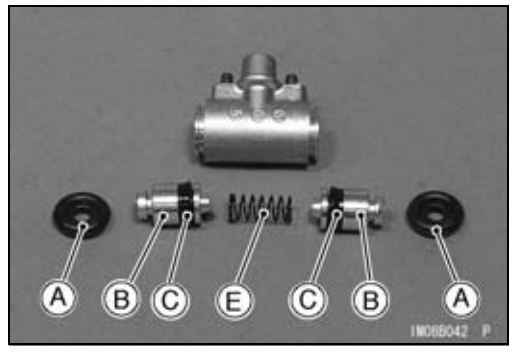
CAUTION

Use only brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning brake parts. Do not use any other fluid for cleaning these parts. Gasoline, motor oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely, and will eventually deteriorate the rubber used in the brake.

Brake Panel Assemblies

Wheel Cylinder Inspection





- Remove the wheel cylinder (see Brake Wheel Cylinder Assembly Replacement in the Periodic Maintenance chapter).
- Disassemble the wheel cylinder.
- Check that there are no scratches, rust or pitting on the inside of the cylinder and on the outside of the piston.

★If the cylinder or piston shows any damage, replace the cylinder.

- Inspect the cups.

★If a cup is worn, damaged, softened (rotted) or swollen, replace the cylinder.

★If fluid leakage is noted at the dust seals, the cylinder should be replaced to renew the cup.

- Check the dust seals for damage.

★If they are damaged, replace the cylinder.

- Check the spring for any damage.

★If the spring is damaged, replace the cylinder.

- Check the brake shoe clearance adjuster for damage (front brake only).

★If it shows any damage, replace the cylinder.

Dust Seal [A]
Piston [B]
Cup [C]
Shoe Clearance Adjuster (Front) [D]
Spring (Rear) [E]

Brake Shoe Lining Wear

- Refer to the Brake Wear Inspection in the Periodic Maintenance chapter.

Brake Shoe Spring Inspection



- Visually inspect the brake shoe springs [A] for breaks or distortion.

★If the springs are damaged in any way, replace them.

(Front Brake Panel)

- Install the upper shoe spring in the original position shown, noting the hook direction.
- Install the lower spring inside the plate of the shoe.



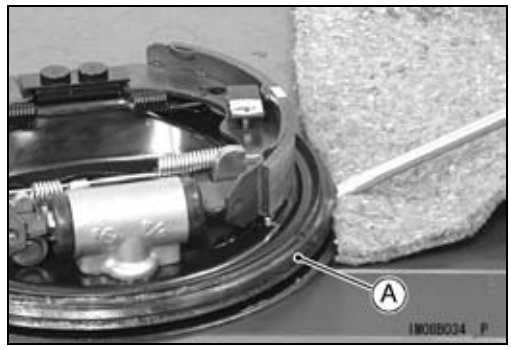
(Rear Brake Panel)

- Install the upper shoe springs in the original position shown, noting the relative position of the coil to the parking brake lever linkage.
- Install the lower spring inside the plate of the shoe.

Brake Panel Assemblies

Grease Seal Replacement

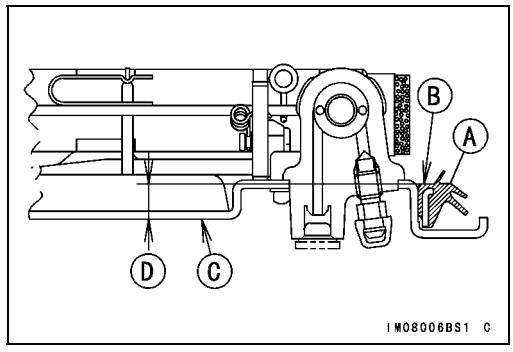
- Remove:
  Brake Panel Assy (see Brake Panel Assy Removal)
  Grease Seal [A]



CAUTION

Be careful not to damage the brake panel when removing the grease seal.

- Install the grease seal [A] to specified position as shown in the figure.
  Top Surface of Grease Seal [B]
  Center Bottom of Brake Panel [C]
  11.2 ~ 12.0 mm (0.44 ~ 0.47 in.) [D]



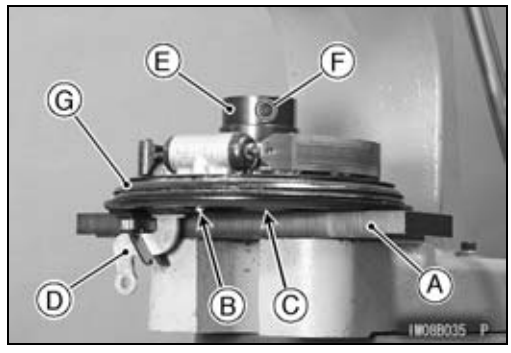
NOTE

○*If the following special tool (Grease Seal Driver Set) is used, the position will be secured.*

- Apply soapsuds to inside area of the new grease seal.
- Put the brake panel on a suitable flat plate [A] so that the bleed valve fitting [B], boss [C] and parking brake lever linkage [D] (rear only) are not contact to the plate.
- Put the guide [E] in the panel so that the UP mark [F] faces upward.

  Special Tool - Grease Seal Driver Set: 57001-1629

- Put the grease seal [G] on the brake panel evenly.



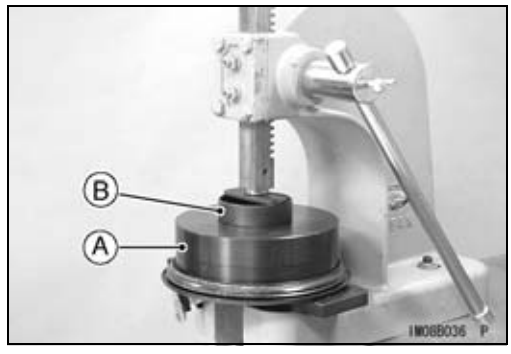
- Put the grease seal driver [A] on the grease seal evenly.

  Special Tool - Grease Seal Driver Set: 57001-1629

- Put the compressor [B] to center on the grease seal driver.

  Special Tool - Clutch Spring Compressor: 57001-1162

- Using a press install the grease seal.
- Apply high-temperature grease (Amoco Rykon Premium Grease No. 2 EP Green) to the grease seal lips (see Brake Drum Installation).



Parking Brake Lever and Cables

Parking Brake Lever Travel Adjustment

- Refer to the Parking Brake Lever Inspection in the Periodic Maintenance chapter.

Parking Brake Cable Lubrication/Inspection

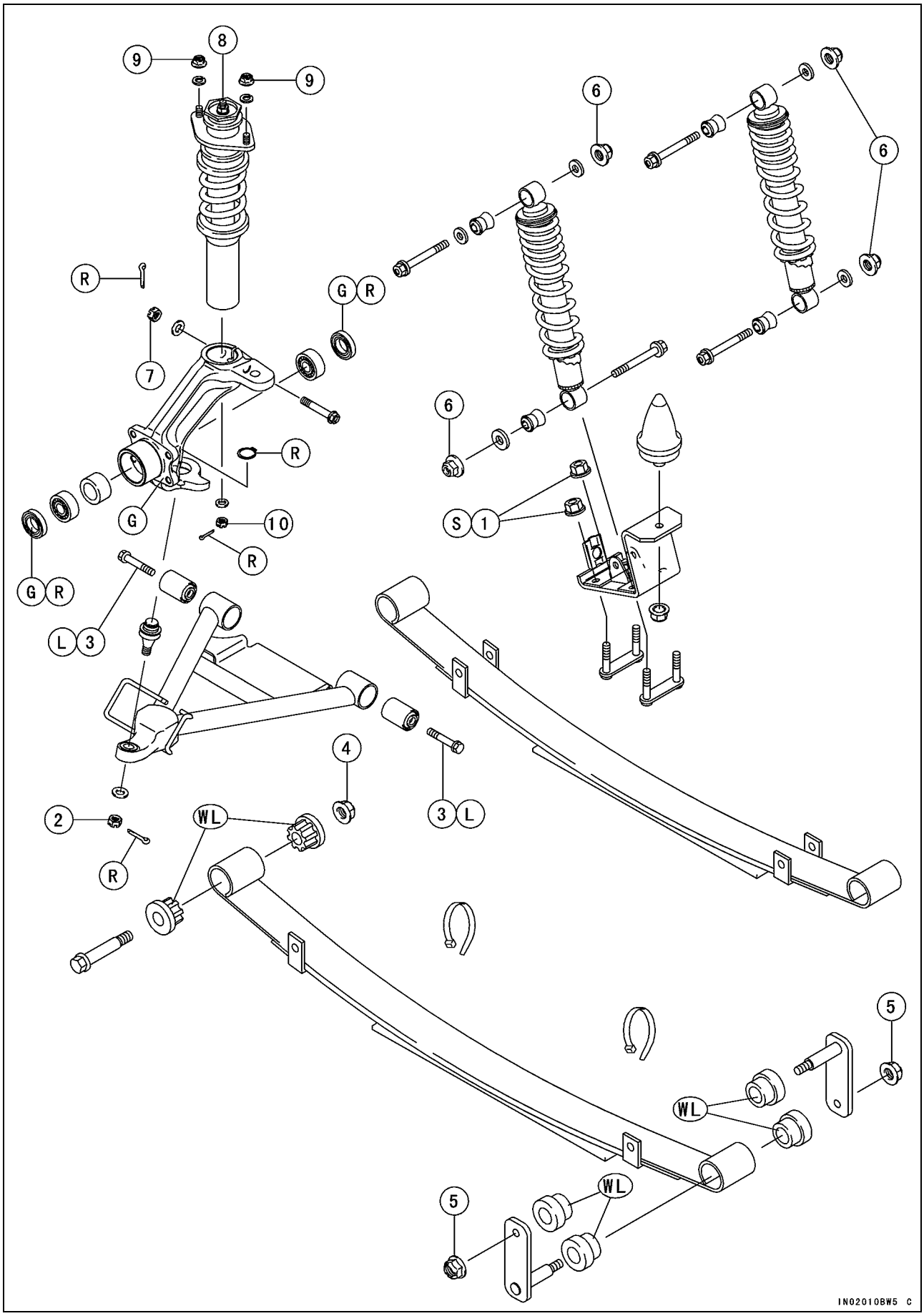
- Refer to the General Lubrication in the Periodic Maintenance chapter.

Suspension

Table of Contents

Exploded View 14-2
Specifications 14-4
Special Tool 14-5
Struts and Rear Shock Absorbers 14-6
  Strut (Front Shock Absorber) Removal 14-6
  Strut (Front Shock Absorber) Installation 14-6
  Strut Spring Replacement 14-7
  Rear Shock Absorber Preload Adjustment 14-9
  Rear Shock Absorber Removal 14-9
  Rear Shock Absorber Installation 14-9
  Shock Absorber Inspection 14-10
Front Suspension Arms 14-11
  Front Suspension Arm Removal 14-11
  Front Suspension Arm Installation 14-11
  Front Suspension Arm Inspection 14-12
Leaf Springs and Dampers 14-13
  Leaf Spring Removal 14-13
  Leaf Spring Installation 14-13
  Leaf Spring Inspection 14-14

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Damper Bracket Mounting Nuts	59	6.0	44	S
2	Front Suspension Arm Joint Nuts	78	8.0	58	
3	Front Suspension Arm Pivot Bolts	98	10.0	72.3	L
4	Leaf Spring Mounting Nuts (Front)	98	10.0	72.3	
5	Leaf Spring Mounting Nuts (Rear)	59	6.0	44	
6	Rear Shock Absorber Mounting Nuts	59	6.0	44	
7	Strut Clamp Nuts	98	10.0	72.3	
8	Strut Locknuts	49	5.0	36	
9	Strut Mounting Locknuts	44	4.5	32	
10	Tie-Rod End Nuts	34	3.5	25	

G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
WL: Apply soap and water solution or rubber lubricant.

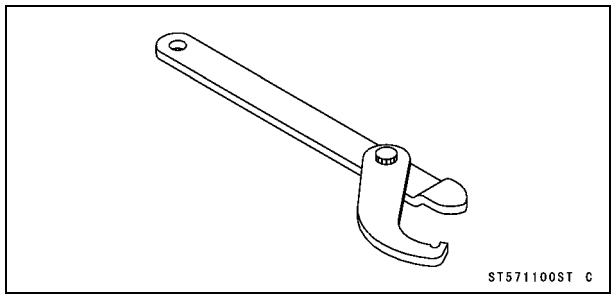
14-4 SUSPENSION

Specifications

Item	Standard	Service Limit
Rear Shock Absorbers		
Spring Preload Setting Position	3rd position	(Usable Range) 1 ~ 5 positions

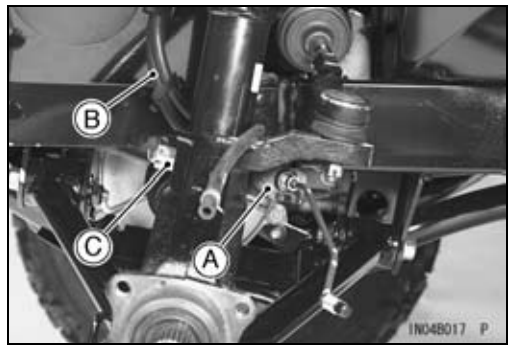
Special Tool

Steering Stem Nut Wrench:
57001-1100



Struts and Rear Shock Absorbers

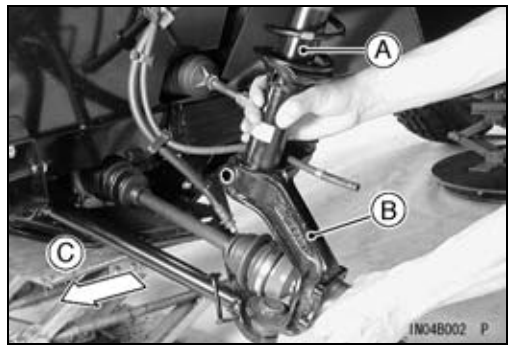
Strut (Front Shock Absorber) Removal



- Remove:
  Glove Compartment (see Glove Compartment Removal in the Frame chapter)
  Front Wheel (see Wheel Removal in the Wheels/Tires chapter)
  Brake Panel (see Brake Panel Assy Removal in the Brakes chapter)
  Brake Hose Retainer [A]
  Brake Hose [B] (from Bracket)
  Cotter Pin
  Strut Clamp Bolt and Nut [C]

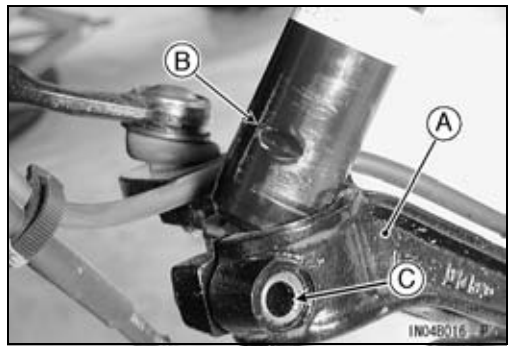


- Remove the strut mounting locknuts [A].



- Remove the strut [A] from the steering knuckle [B].
  Front [C]

Strut (Front Shock Absorber) Installation



- Insert the strut to the steering knuckle [A] while aligning the notch [B] on the strut with the clamp bolt hole [C] on the steering knuckle.
- Tighten:

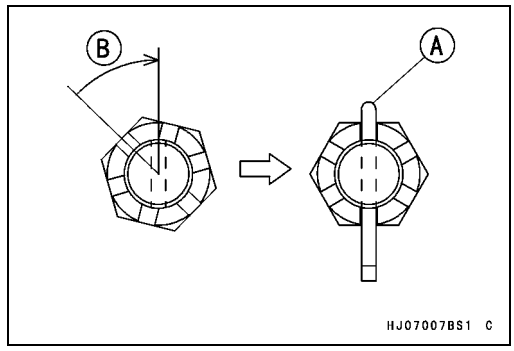
Torque - Strut Mounting Locknuts: 44 N·m (4.5 kgf·m, 32 ft·lb)
Strut Clamp Nuts: 98 N·m (10.0 kgf·m, 72.3 ft·lb)

Struts and Rear Shock Absorbers

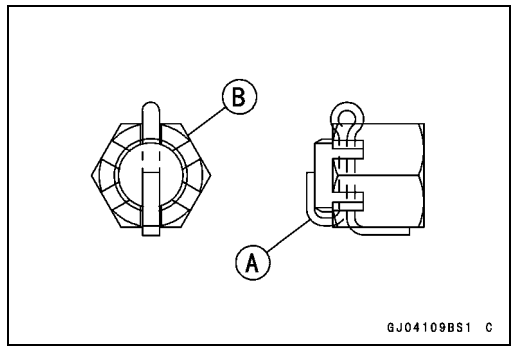
● Insert a new cotter pin [A].

NOTE

○*When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.*
○*It should be within 30°.*
○*Loosen once and tighten again when the slot goes past the nearest hole.*



● Bend the cotter pin [A] over the nut [B].

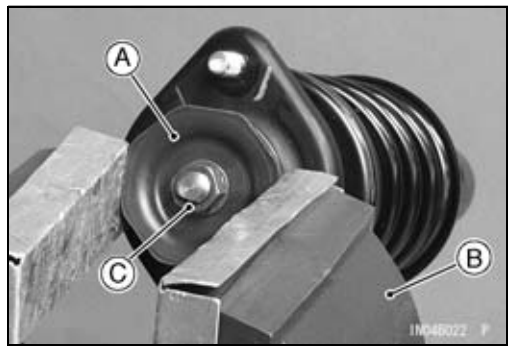


Strut Spring Replacement

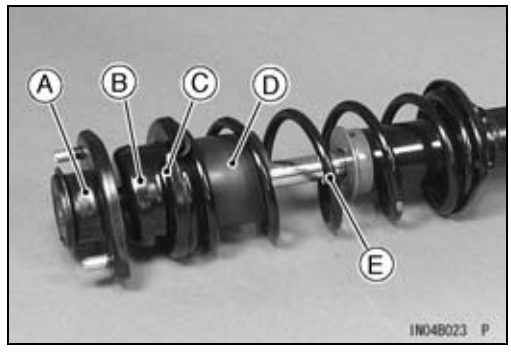
In addition to the standard springs, hard springs are available.

The hard springs stiffen the strut action and accelerate the rebound damping.

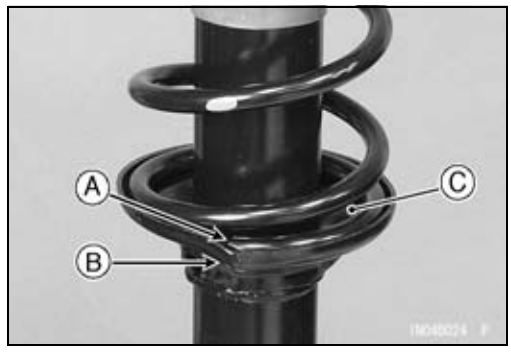
● Remove the strut (see Strut (Front Shock Absorber) Removal).
● Hold the large washer [A] in a vise [B].
● Remove:
Locknut [C] and Small Washer
Large Washer



● Remove:
Holder [A]
Thrust Plate [B]
Dust Seal
Thrust Washer
Upper Spring Seat [C]
Dust Cover [D]
Spring [E]

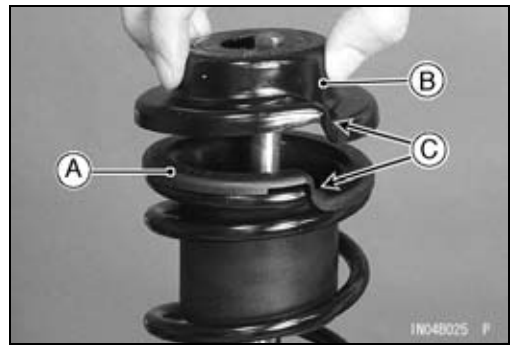


● Install the replaced spring.
○Fit the spring end [A] to the bulge [B] in the lower spring seat [C].

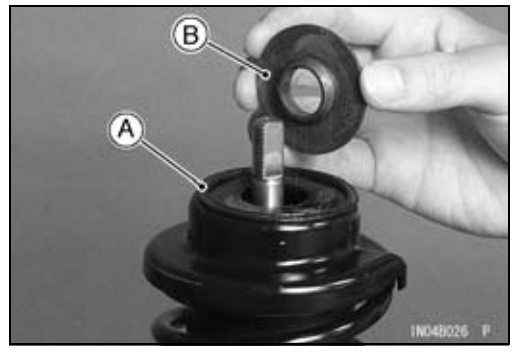


Struts and Rear Shock Absorbers

● Install:
Dust Cover [A]
Upper Spring Seat [B]
○Fit the spring end to the bulge [C] in the dust cover and upper spring seat.

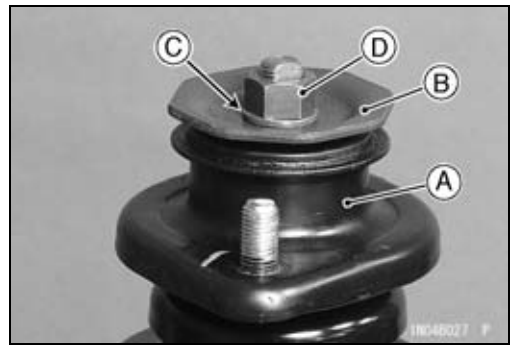


● Apply grease to the upper and lower side on the following parts, and install them.
Dust Seal [A]
Thrust Washer [B]
○Face the projection on the thrust washer downward.



● Install:
Holder [A]
Large Washer [B]
Small Washer [C]
Locknut [D]
○Push down the holder, and tighten the locknut.

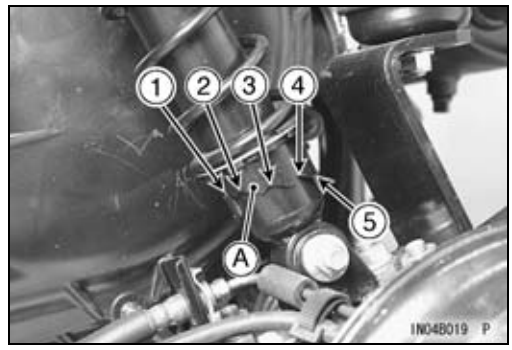
Torque - Strut Locknuts: 49 N·m (5.0 kgf·m, 36 ft·lb)

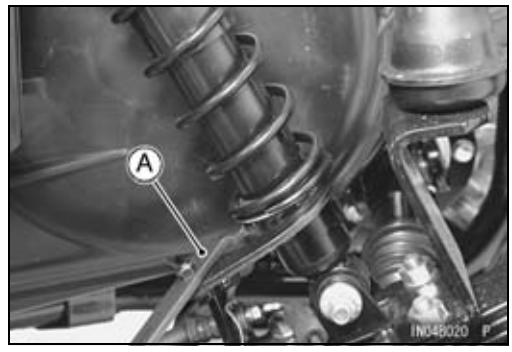


Struts and Rear Shock Absorbers

Rear Shock Absorber Preload Adjustment

The spring adjusting sleeve [A] on the rear shock absorbers have 5 positions so that the springs can be adjusted for different terrain and loading conditions. If the spring action feels too soft or too stiff, adjust it in accordance with the following table.





Spring Action

Position	Spring Force	Setting	Load	Terrain	Speed
1	Weak	Soft	Light	Smooth	Low
2	↑	↑	↑	↑	↑
3 (STD)					
4	↓	↓	↓	↓	↓
5	Strong	Hard	Heavy	Rough	High

- Remove the rear wheel (see Wheel Removal in the Wheels/Tires chapter).
- Turn the adjusting sleeve on each rear shock absorber to the desired position with the wrench [A].

Special Tool - Steering Stem Nut Wrench: 57001-1100

○Both adjusting sleeves (left and right) must be turned to the same relative position.

⚠ WARNING

If both adjusting sleeves are not adjusted equally, handling may be impaired and a hazardous condition may result.

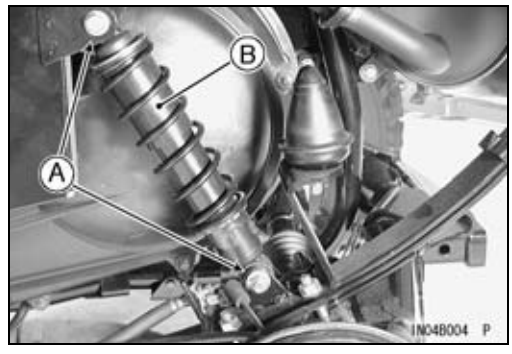
Rear Shock Absorber Removal

- Remove:

  Rear Wheel (see Wheel Removal in the Wheels/Tires chapter)

  Rear Shock Absorber Mounting Bolts and Nuts [A] (while moving the frame up or down with a jack)

  Rear Shock Absorber [B]



Rear Shock Absorber Installation

- Install the rear wheel temporarily and ground it to load the suspension.
- Tighten:

Torque - Rear Shock Absorber Mounting Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)

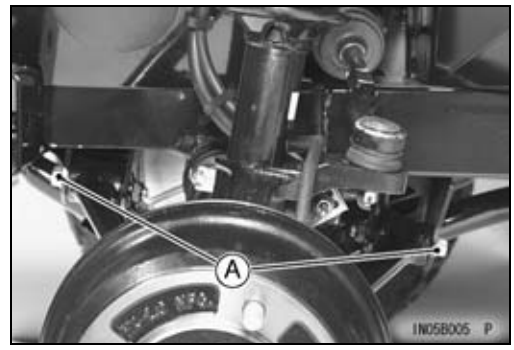
Struts and Rear Shock Absorbers

Shock Absorber Inspection

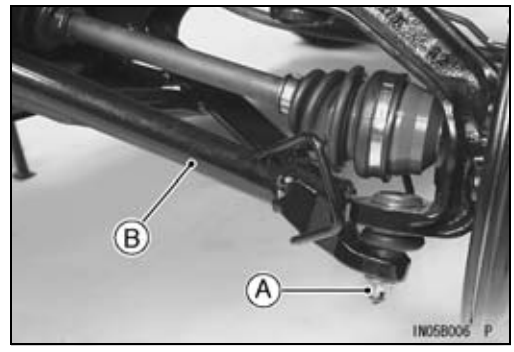
- Visually inspect the shock absorber for breaks or distortion.
★ If the shock absorber is damaged in any way, replace it.
- Check for oil leakage at the shock absorber damper unit.
★ If oil leakage is noted, the shock absorber should be replaced to renew the oil seal.
- Visually inspect the rubber bushings in the upper and/or lower mountings of the rear shock absorber.
★ If they are worn, cracked, hardened, or otherwise damaged, replace them with new ones.

Front Suspension Arms

Front Suspension Arm Removal



- Remove:
  Front Wheel (see Wheel Removal in the Wheels/Tires chapter)
  Front Guard (see Front Guard Removal in the Frame chapter)
- Hold the front brake drum and panel assembly in position.
- Remove the front suspension arm pivot bolts [A].

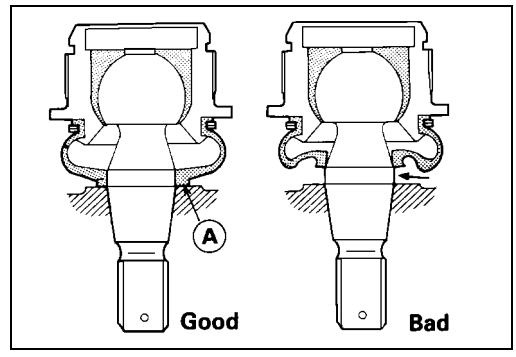


- Remove:
  Cotter Pin
  Front Suspension Arm Joint Nut [A]
  Front Suspension Arm Joint (from Steering Knuckle)

○Remove the front suspension arm joint from the steering knuckle, using a suitable joint remover (see Steering Gear Assembly Removal in the Steering chapter).

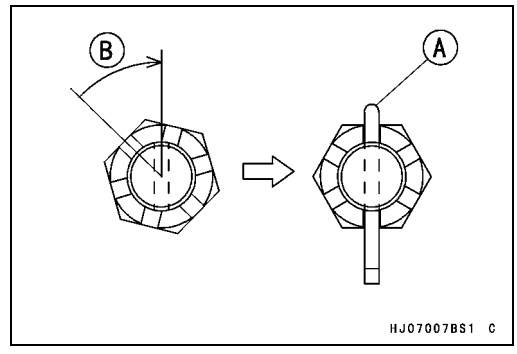
- Remove the front suspension arm [B].

Front Suspension Arm Installation



- Clean the tapered portion of the front suspension arm joint and the tapered hole of the suspension arm, or the tapers will not fit snugly.
- Apply grease to the sealing surface [A] of the front suspension arm joint boot.
- When the front suspension arm pivot bolts are tightened, install the arm joint to the suspension arm to position the arm within its operating angle.
- Apply a non-permanent locking agent to the threads of the front suspension arm pivot bolts.
- Tighten:

Torque - Front Suspension Arm Pivot Bolts: 98 N·m (10.0 kgf·m, 72.3 ft·lb)
Front Suspension Arm Joint Nut: 78 N·m (8.0 kgf·m, 58 ft·lb)



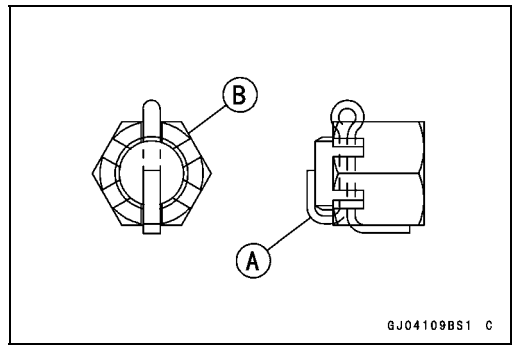
- Insert a new cotter pin [A].

NOTE

○*When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.*
○*It should be within 30°.*
○*Loosen once and tighten again when the slot goes past the nearest hole.*

Front Suspension Arms

● Bend the cotter pin [A] over the nut [B].



Front Suspension Arm Inspection

● Visually inspect the front suspension arm for breaks or distortion.

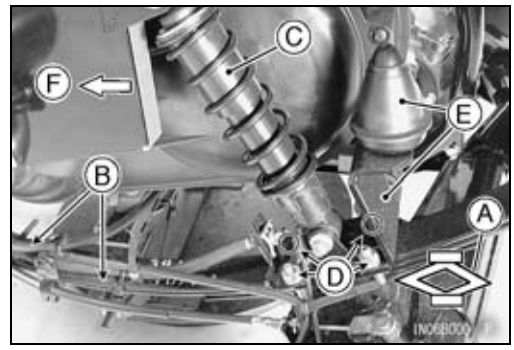
★If the front suspension arm is damaged in any way, replace it.

● Check the rubber bushings in the pivots.

★Replace any bushings that are worn, cracked, hardened, or otherwise damaged.

Leaf Springs and Dampers

Leaf Spring Removal



- Remove the rear wheel (see Wheel Removal in the Wheels/Tires chapter).
- Support the rear axle housing on a jack [A].
- Unscrew the brake pipe nipple from the brake panel and plug it.

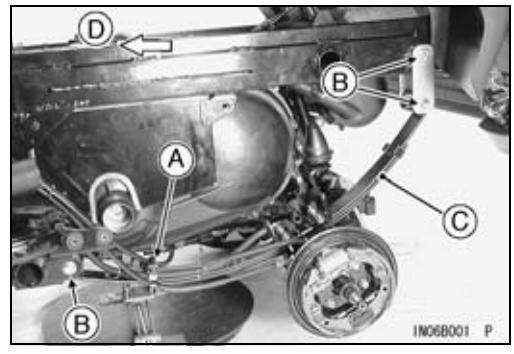
○Immediately wipe up any brake fluid that spills.

CAUTION

Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.

- Cut the straps [B] and free the vent hose and the brake hose from the leaf spring.
- Tilt up the cargo bed.
- Remove:

  Converter Air Cleaner Housing (see Air Cleaner Housing Removal in the Converter System chapter)
  Rear Shock Absorber [C]
  Damper Bracket Mounting Nuts [D]
  Damper and Bracket [E]
  Front [F]



- Remove:

  Clamp [A]
  Leaf Spring Mounting Bolt and Nuts [B]
  Leaf Spring [C]
  Front [D]

Leaf Spring Installation

- When installing the rubber bushings to the leaf spring, lubricate them with a soap and water solution.

CAUTION

Do not use engine oil or petroleum distillates to lubricate the bushings because they will deteriorate the rubber.

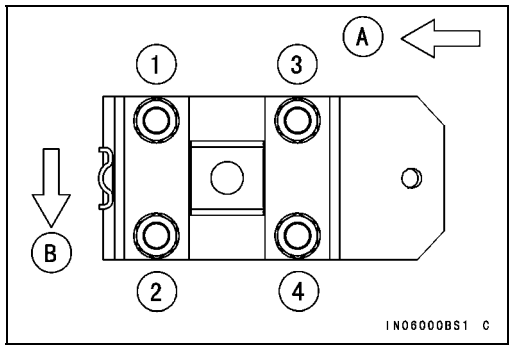
- Install the rear wheel temporarily and ground it to load the suspension during the mounting nut tightening.
- Tighten:

Torque - Leaf Spring Mounting Nuts (Front): 98 N·m (10.0 kgf·m, 72.3 ft·lb)
Leaf Spring Mounting Nuts (Rear): 59 N·m (6.0 kgf·m, 44 ft·lb)
Rear Shock Absorber Mounting Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)

Leaf Springs and Dampers

- Tighten the damper bracket mounting nuts in the order as shown in the figure.
  Front [A]
  Outside [B]

Torque - Damper Bracket Mounting Nuts:
First: 20 N·m (2.0 kgf·m, 15 ft·lb)
Second: 44 N·m (4.5 kgf·m, 32 ft·lb)
Final: 59 N·m (6.0 kgf·m, 44 ft·lb)



- Apply brake fluid to the brake pipe nipple threads.
- Tighten:

Torque - Brake Pipe Nipples: 18 N·m (1.8 kgf·m, 13 ft·lb)

- Bleed the brake line (see Brake Line Air Bleeding in the Brakes chapter).

Leaf Spring Inspection

- Visually inspect the leaf spring for breaks or distortion.
★If the leaf spring is damaged in any way, replace it.
- Check the rubber bushings in the mounts and the damper.
★Replace any bushings or damper that are worn, cracked, hardened, or otherwise damaged.

Steering

Table of Contents

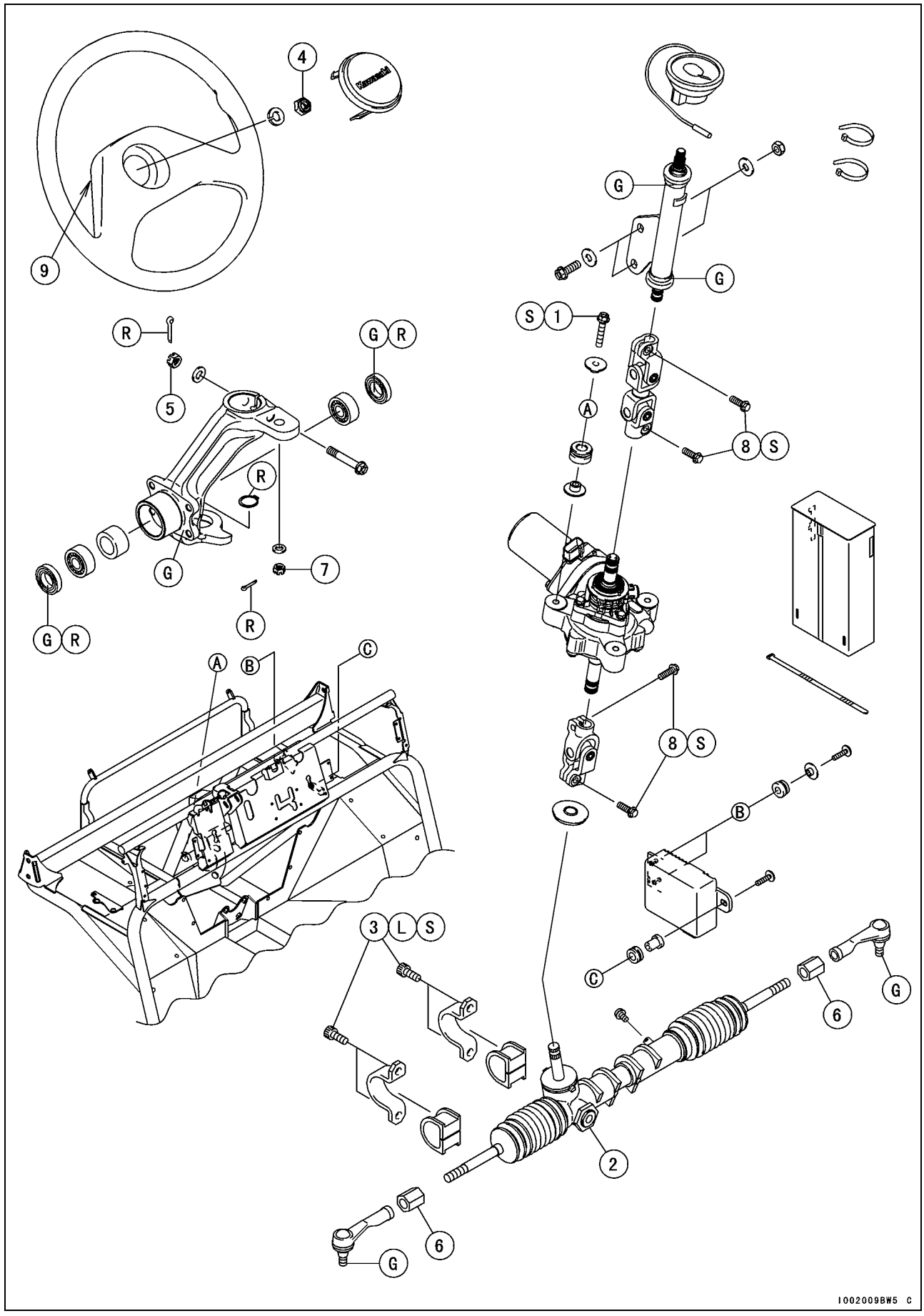
Exploded View 15-2
Specifications 15-4
Special Tools 15-5
Steering Wheel and Main Shaft Assembly 15-6
- Steering Wheel Position Adjustment 15-6
- Steering Wheel Free Play Inspection 15-6
- Steering Wheel Centering 15-6
- Steering Wheel and Steering Shaft Removal 15-6
- Steering Wheel and Steering Shaft Installation 15-8

Steering Gear Assembly 15-11
- Steering Gear Assembly Removal 15-11
- Steering Gear Assembly Installation 15-12
- Steering Gear Preload Adjustment 15-13
- Tie-Rod Length Adjustment 15-14
- Steering Joint Dust Boot Inspection 15-14

Steering Knuckles 15-15
- Steering Knuckle Removal 15-15
- Steering Knuckle Installation 15-15
- Knuckle Bearing Removal 15-16
- Knuckle Bearing Installation 15-16
- Knuckle Joint Removal 15-16
- Knuckle Joint Installation 15-17

EPS (Electric Power Steering) System 15-18
- EPS System Servicing Precautions 15-21
- EPS System Troubleshooting Outline 15-22
- Inquiries to Rider 15-26
- Self-diagnosis Outline 15-26
- Self-diagnosis Procedure 15-27
- Service Code Reading 15-28
- Service Code Erasing 15-28
- Service Code Erasing Procedures 15-31
- EPS Neutral Position Registration 15-33
- Power Supply Voltage Abnormal (Service Code 11,12) 15-36
- EPS Neutral Position Unregistration (Service Code 31) 15-36
- Current Sensor Inspection (Service Code 32) 15-36
- FET (Field Effect Transistor) Inspection (Service Code 33) 15-37
- Internal Relay Inspection (Service Code 34) 15-37
- CPU (Central Processing Unit) Inspection (Service Code 35) 15-38
- Direction Distinction Circuit Inspection (Service Code 36) 15-38
- Boosting Transformer Circuit Inspection (Service Code 37) 15-38
- EPS Torque Sensor Inspection (Service Code 51) 15-39
- EPS Motor Inspection (Service Code 61) 15-40
- EPS Warning Indicator Light (LED) Removal 15-41
- EPS Warning Indicator Light (LED) Inspection 15-41
- EPS ECU Removal 15-42
- EPS ECU Installation 15-43
- EPS ECU Power Supply Voltage Inspection 15-44
- EPS Motor Removal 15-45
- EPS Torque Sensor Removal 15-45
- EPS Unit Removal 15-46
- EPS Unit Installation 15-47
- Speed Sensor Removal/Installation 15-49
- Speed Sensor Inspection 15-49
- 40 A EPS Fuse Removal 15-50
- 7.5 A EPS Fuse Removal 15-51
- Fuse Installation 15-52
- Fuse Inspection 15-52

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	EPS Unit Mounting Bolts	20	2.0	15	S
2	Rack Guide Spring Cap Locknut	39	4.0	29	
3	Steering Gear Assembly Bracket Bolts	52	5.3	38	L, S
4	Steering Wheel Mounting Nut	52	5.3	38	
5	Strut Clamp Nuts	98	10.0	72.3	
6	Tie-Rod End Locknuts	49	5.0	36	
7	Tie-Rod End Nuts	34	3.5	25	
8	Universal Joint Clamp Bolts	20	2.0	15	S

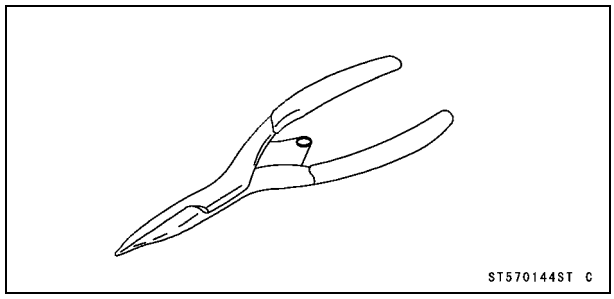
9. Apply grease on contact plate.
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
S: Follow the specified tightening sequence.

Specifications

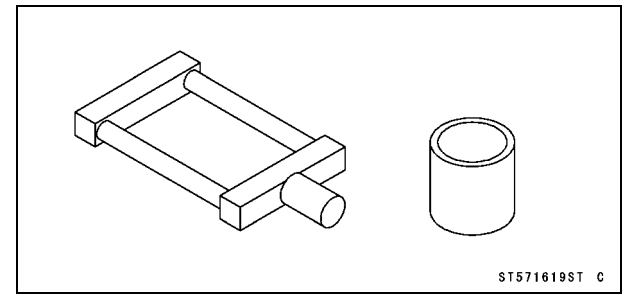
Item	Standard	Service Limit
Steering Wheel		
Steering Wheel Free Play	0 ~ 20 mm (0 ~ 0.79 in.)	– – –
Steering Gear Assembly		
Tie-Rod Length (distance between boot end and locknut)	43.5 mm (1.71 in.)	– – –

Special Tools

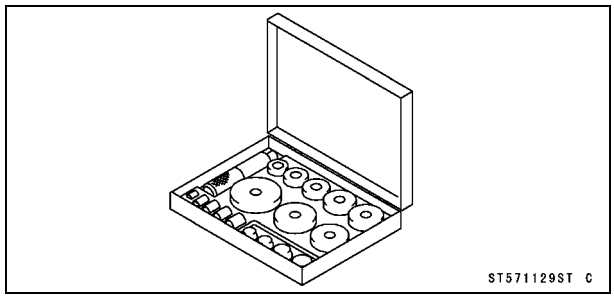
Outside Circlip Pliers:
57001-144



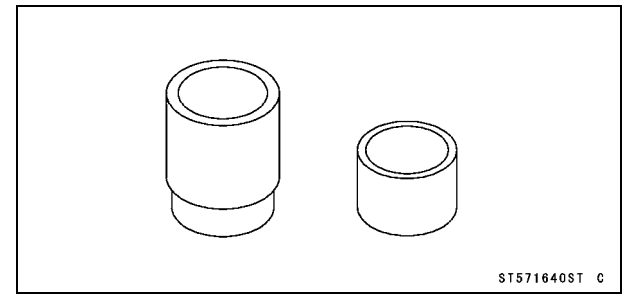
Knuckle Joint Remover:
57001-1619



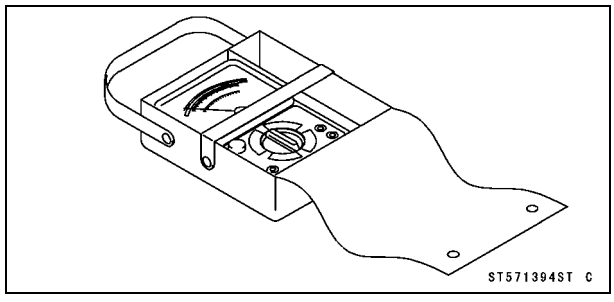
Bearing Driver Set:
57001-1129



Knuckle Joint Driver:
57001-1640

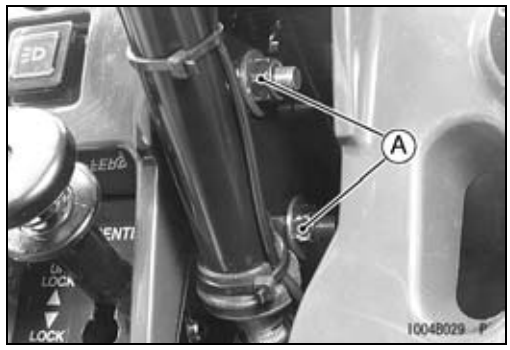


Hand Tester:
57001-1394



Steering Wheel and Main Shaft Assembly

Steering Wheel Position Adjustment



- Loosen the steering shaft mounting nuts [A].
- Adjust the steering wheel position.
- Tighten the main shaft bracket mounting nuts securely.

Steering Wheel Free Play Inspection

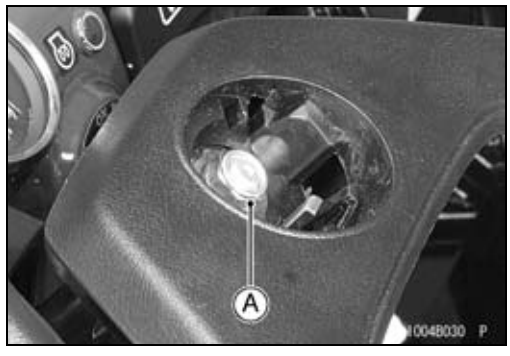
- Refer to the Steering Inspection in the Periodic Maintenance chapter.

Steering Wheel Centering

- Test ride the vehicle.

★If the steering wheel is not straight when the vehicle is traveling in a straight line, do the following.

- Check the tie-rod length and adjust it if necessary.
- Remove the wheel cap and horn switch (see Steering Wheel and Steering Shaft Removal).

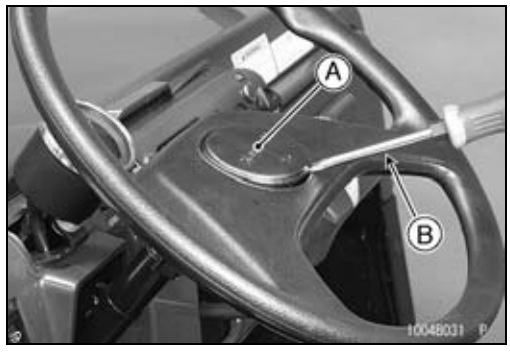


- Loosen the steering wheel mounting nut [A].
- Push the vehicle in a straight line with no one aboard, and stop it without turning the steering wheel.
- Remount the steering wheel so that it is straight ahead.
- Install the spring washer and tighten the mounting nut.

Torque - Steering Wheel Mounting Nut: 52 N·m (5.3 kgf·m, 38 ft·lb)

- Install the horn switch and wheel cap (see Steering Wheel and Steering Shaft Installation).
- Be sure to register the EPS neutral position (see EPS Neutral Position Registration).

Steering Wheel and Steering Shaft Removal

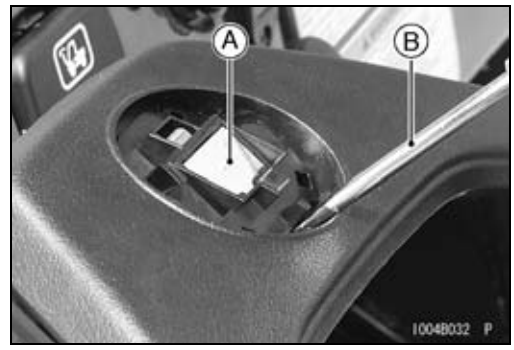


- Remove the wheel cap [A].

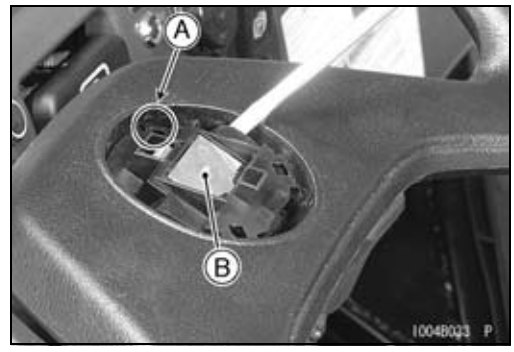
○Pry the wheel cap with a thin driver [B].

Steering Wheel and Main Shaft Assembly

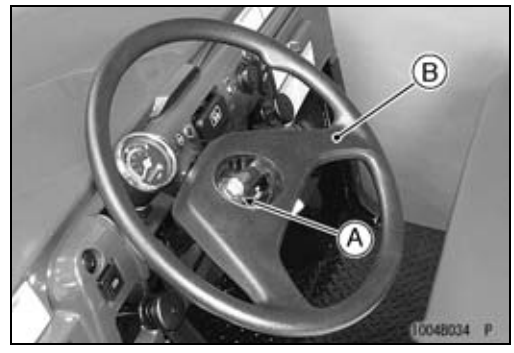
● Remove the horn switch [A] as follows.
○Pry the rear part of the switch with a thin driver [B] for the rear stopper is free.



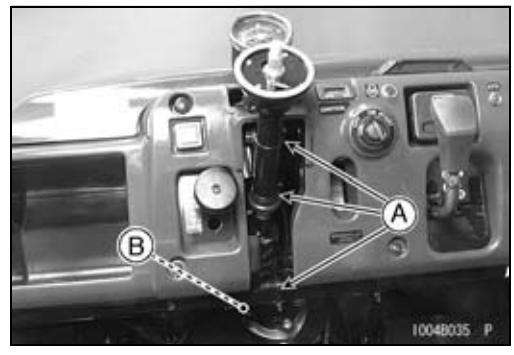
○Pry the one side part of the switch with a thin driver for the stopper [A] is free.
○Remove the horn switch [B].



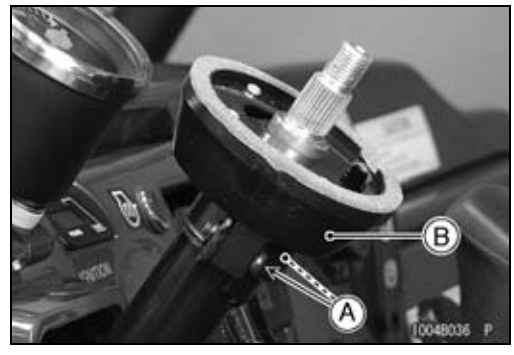
● Remove:
Steering Wheel Mounting Nut [A] and Spring Washer
Steering Wheel [B]



● Cut the bands [A].
● Disconnect the horn switch and connector [B].

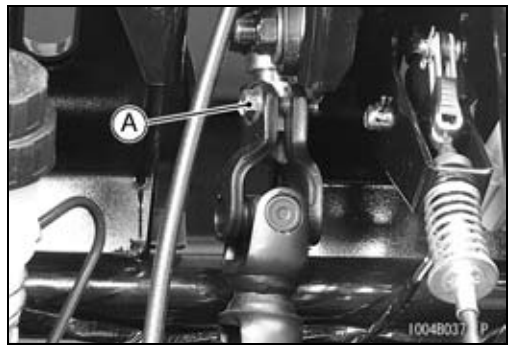


● Remove:
Screws [A] and Holder
Horn Switch Contact [B]

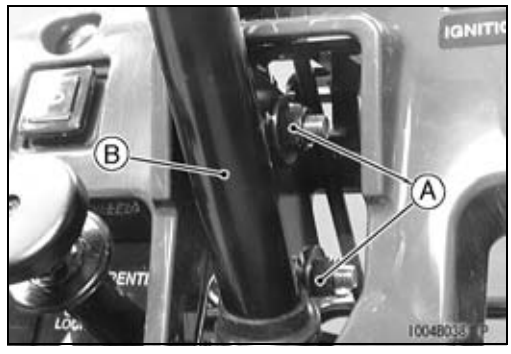


Steering Wheel and Main Shaft Assembly

- Remove:
  Front Cargo Compartment (see Front Cargo Compartment Removal in the Frame chapter)
  Universal Joint Clamp Bolt [A]

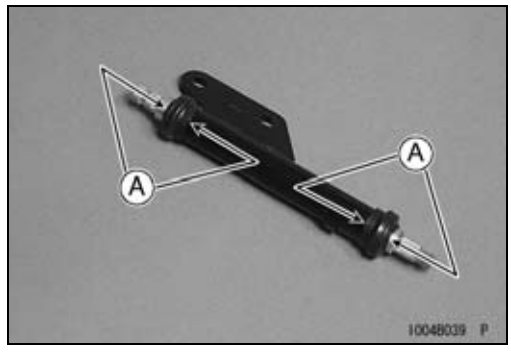


- Remove:
  Steering Shaft Mounting Bolts, Washers and Nuts [A]
  Steering Shaft [B]



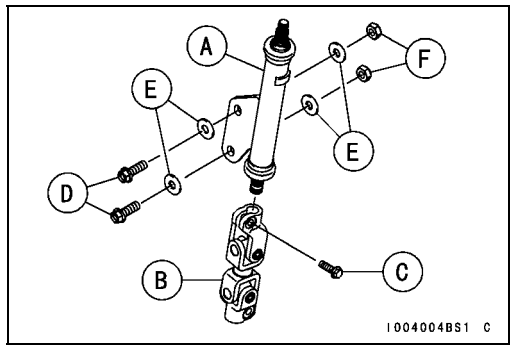
Steering Wheel and Steering Shaft Installation

- Apply grease to the dust cover lips [A].



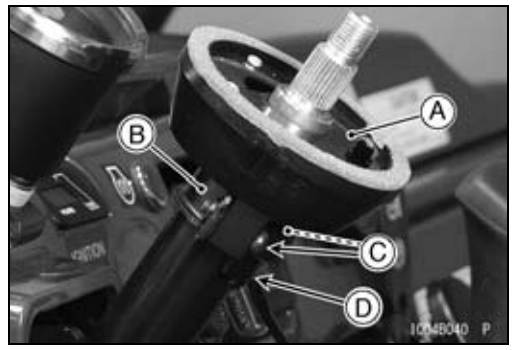
- Install the steering shaft [A] to the upper universal joint [B].
- Install the universal joint clamp bolt [C] while aligning the notch on the steering shaft with the clamp bolt hole on the upper universal joint, and tighten it temporary.
- Install the steering shaft mounting bolts [D], washers [E] and nuts [F].
- Tighten the universal joint clamp bolt to the specified torque.

  Torque - Universal Joint Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)

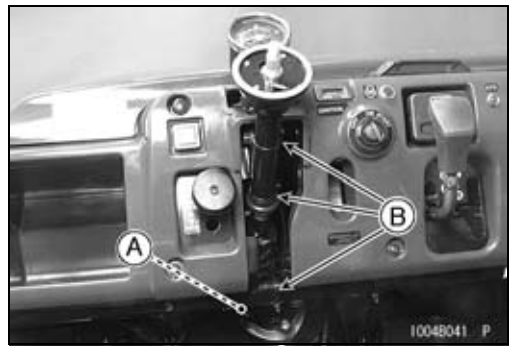


Steering Wheel and Main Shaft Assembly

● Install:
Horn Switch Contact [A]
Holder [B]
Screws [C]
○Position the horn switch contact on the projection [D].



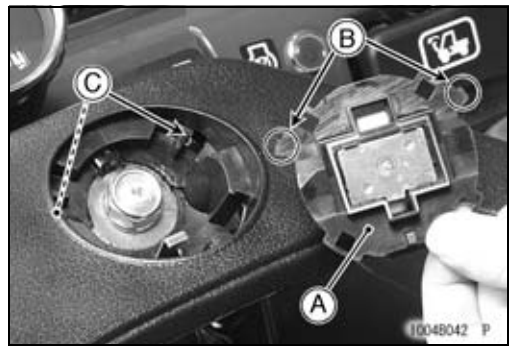
● Connect the horn switch lead connector [A] and clamp the bands [B].



● Mount the steering wheel on the steering shaft temporarily.
● Adjust the following items.
Steering Wheel Position (see Steering Wheel Position Adjustment)
Steering Wheel Centering (see Steering Wheel Centering)
● Tighten:

Torque - Steering Wheel Mounting Nut: 52 N·m (5.3 kgf·m, 38 ft·lb)

● Install the horn switch [A] as follows.
○Fit the front stoppers [B] in the recesses [C] of the steering wheel.

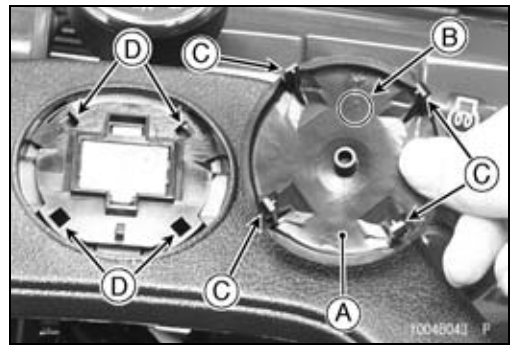


○Fit the rear stopper [A] in the recess of the steering wheel and push the rear part until sound click.



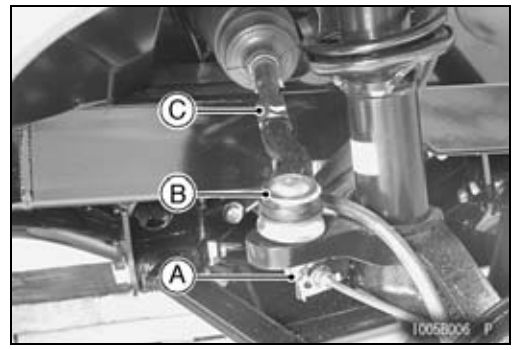
Steering Wheel and Main Shaft Assembly

- Install the wheel cap [A] so that the arrow mark [B] faces front and the stoppers [C] fit the recesses [D] of the horn switch.
- Be sure to register the EPS neutral position (see EPS Neutral Position Registration).



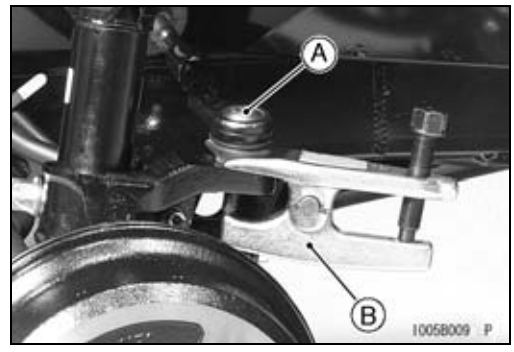
Steering Gear Assembly

Steering Gear Assembly Removal

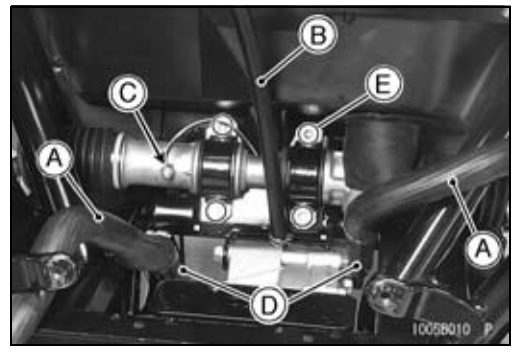


- Remove:
  Front Wheels (see Wheel Removal in the Wheels/Tires chapter)
  Radiator (see Radiator Removal in the Cooling System chapter)
  Cotter Pins (Both Sides)
  Tie-Rod End Nuts [A] (Both Sides)
  Tie-Rod Ends [B] from Steering Knuckles (Both Sides)

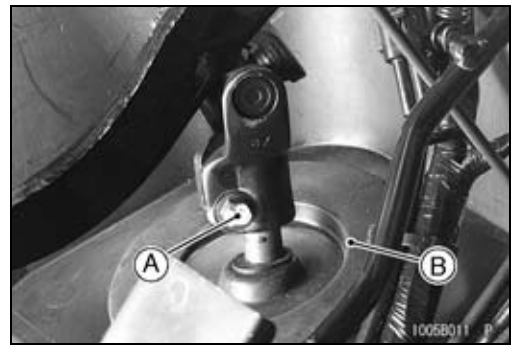
CAUTION
Do not loosen the tie-rod end locknuts [C], or the toe-in of the front wheels will be changed.



○Remove the tie-rod end [A] from the steering knuckle, using a suitable joint remover [B].



- Remove:
  Left Radiator Side Cover (see Radiator Side Cover Removal in the Frame chapter)
  Water Hoses [A]
  Vent Hose [B]
  Horn Ground Lead Terminal [C]
- Remove the mounting bolts of the water pipes [D], and lower them.
- Remove the steering gear assembly bracket bolts [E] and brackets.



- Remove the universal joint clamp bolt [A].

★If the clamp bolt becomes hard to turn, search the position that it can be easily turned while turning the steering wheel slowly.

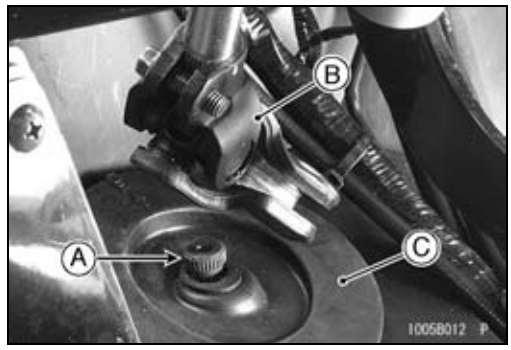
- Pull out the rubber boot [B] upward temporary.

Steering Gear Assembly

- Move the steering gear assembly, and pull off the shaft [A] from the lower universal joint [B].

○Lower the steering gear assembly, and then pull it forward.

- Remove the rubber boot [C].

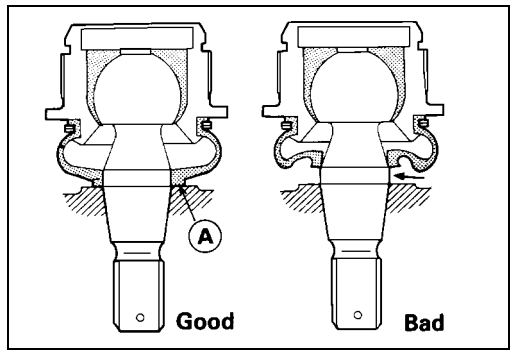


- Remove the steering gear assembly [A].



Steering Gear Assembly Installation

- Adjust the following items if necessary.
  Steering Gear Preload (see Steering Gear Preload Adjustment)
  Tie-Rod Length (see Tie-Rod Length Adjustment)
- Clean the tapered portion of the tie-rod end joint and the tapered hole of the steering knuckle, or the tapers will not fit snugly.
- Apply grease to the sealing surface [A] of the tie-rod end joint boot.

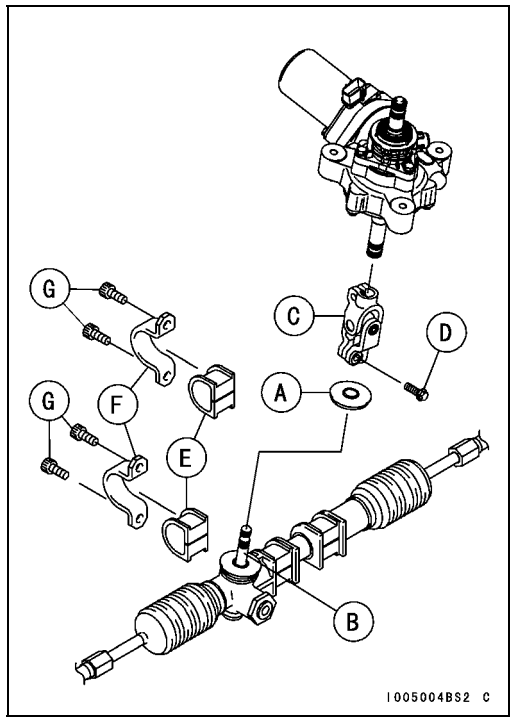


- Install the rubber boot [A] on the shaft [B] of the steering gear assembly temporary.
- Install the shaft of the steering gear assembly to the lower universal joint [C].
- Install the universal joint clamp bolt [D] while aligning the notch on the shaft of the steering gear assembly with the clamp bolt hole on the lower universal joint, and tighten it temporary.
- Install:
  Rubber Dampers [E]
  Brackets [F]
- Apply a non-permanent locking agent to the steering gear assembly bracket bolts [G] and tighten them evenly.

  Torque - Steering Gear Assembly Bracket Bolts: 52 N·m (35.3 kgf·m, 238 ft·lb)

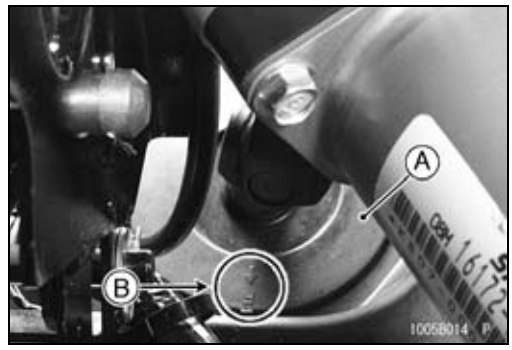
- Tighten the universal joint clamp bolt to the specified torque.

  Torque - Universal Joint Clamp Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)



Steering Gear Assembly

- Install the rubber boot [A] so that the mark (F, Arrow) [B] faces forward.



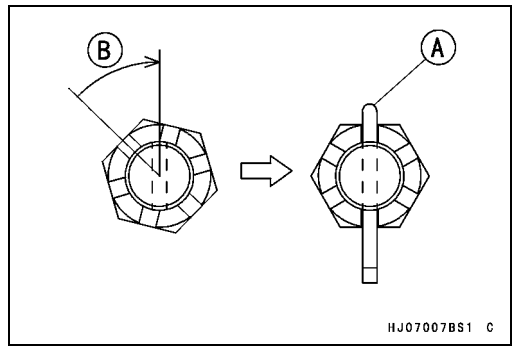
- Tighten:

Torque - Tie-Rod End Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)

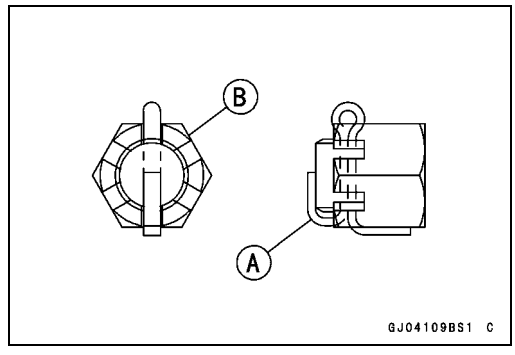
- Insert a new cotter pin [A].

NOTE

○*When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.*
○*It should be within 30°.*
○*Loosen once and tighten again when the slot goes past the nearest hole.*



- Bend the cotter pin [A] over the nut [B].
- Check the toe-in of the front wheels (see Toe-in Adjustment in the Wheels/Tires chapter).
- Be sure to register the EPS neutral position (see EPS Neutral Position Registration).



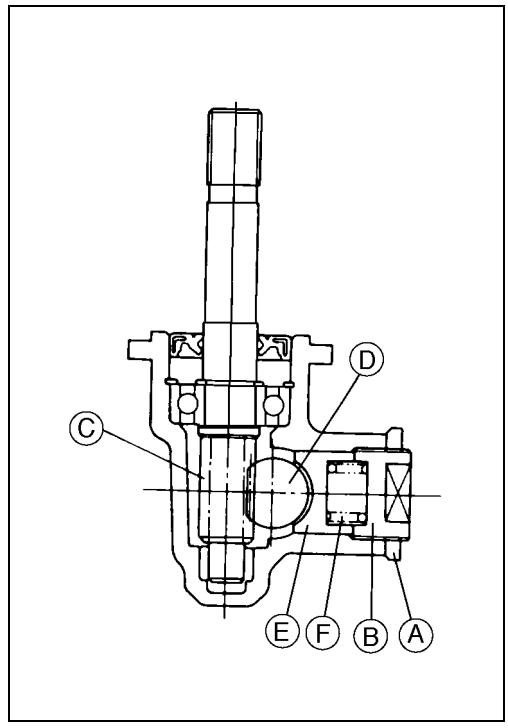
Steering Gear Preload Adjustment

- Loosen the locknut [A].
- Tighten the rack guide spring cap [B] to 12.3 N·m (1.25 kgf·m, 109 in·lb) of torque.
- Back off the cap 40 ~ 60°.
- Tighten the locknut while preventing the cap from turning.

Torque - Rack Guide Spring Cap Locknut: 39 N·m (4.0 kgf·m, 29 ft·lb)

Pinion [C]
Rack [D]
Rack Guide [E]
Spring [F]

- Be sure to register the EPS neutral position (see EPS Neutral Position Registration).



Steering Gear Assembly

Tie-Rod Length Adjustment



- Refer to the Toe-in Adjustment in the Wheels/Tires chapter.

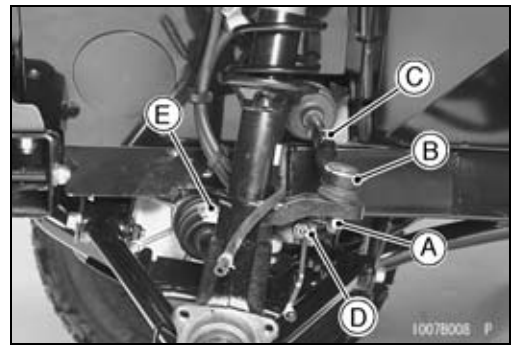
Tie-Rod Length [A]
Front [B]

Steering Joint Dust Boot Inspection

- Refer to the Steering Joint Dust Boot Inspection in the Periodic Maintenance chapter.

Steering Knuckles

Steering Knuckle Removal



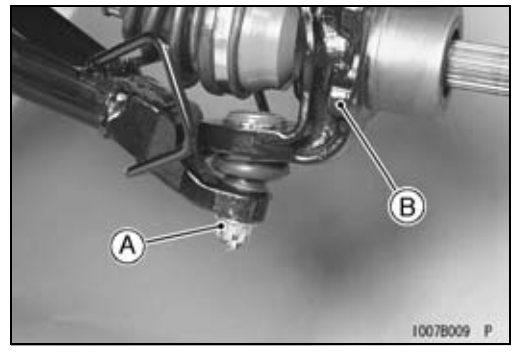
- Remove:
  Front Brake Panel Assembly (see Brake Panel Assy Removal in the Brakes chapter)
  Cotter Pin
  Tie-Rod End Nut [A]
  Tie-Rod End [B] from Steering Knuckle

○Remove the tie-rod end from the steering knuckle, using a suitable joint remover (see Steering Gear Assembly Removal).

CAUTION

Do not loosen the tie-rod end locknuts [C], or the toe-in of the front wheels will be changed.

- Remove:
  Brake Hose Retainer [D]
  Cotter Pin
  Strut Clamp Bolt and Nut [E]

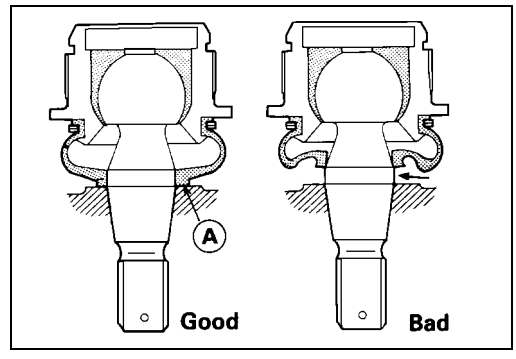


- Remove:
  Cotter Pin
  Front Suspension Arm Joint Nut [A]
  Front Suspension Arm Joint from Steering Knuckle

○Remove the front suspension arm joint from the steering knuckle, using a suitable joint remover (see Steering Gear Assembly Removal).

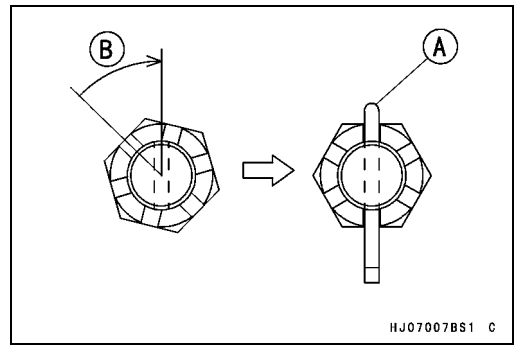
- Remove the steering knuckle [B].

Steering Knuckle Installation



- Clean the tapered portions of the front suspension arm joint and the tie-rod end joint and the tapered holes of the steering knuckle and the front suspension arm, or the tapers will not fit snugly.
- Apply grease to the following portions.
  Axle Bearing Grease Seal Lips
  Front Suspension Arm Joint Boot Sealing Surfaces [A]
- Tighten:

Torque - Strut Clamp Nuts: 98 N·m (10.0 kgf·m, 72.3 ft·lb)
Front Suspension Arm Joint Nuts: 78 N·m (8.0 kgf·m, 58 ft·lb)
Tie-Rod End Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)



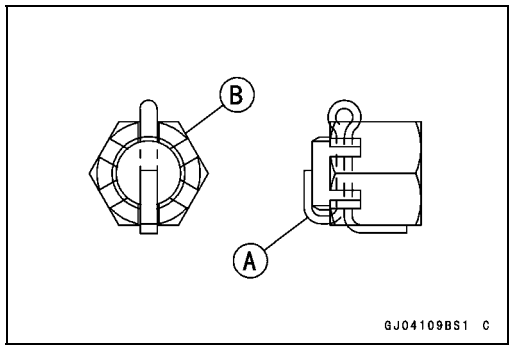
- Insert a new cotter pin [A].

NOTE

○*When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.*
○*It should be within 30°.*
○*Loosen once and tighten again when the slot goes past the nearest hole.*

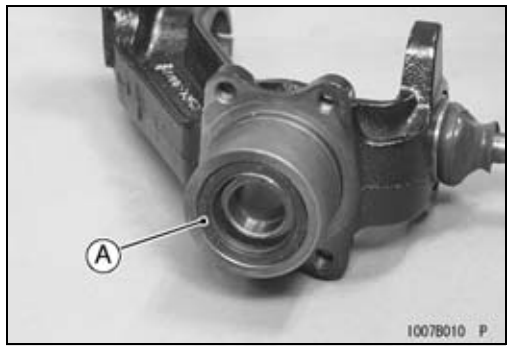
Steering Knuckles

- Bend the cotter pin [A] over the nut [B].
- Check the toe-in of the front wheels (see Toe-in Adjustment in the Wheels/Tires chapter).
- Be sure to register the neutral position of the EPS (see EPS Neutral Position Registration).



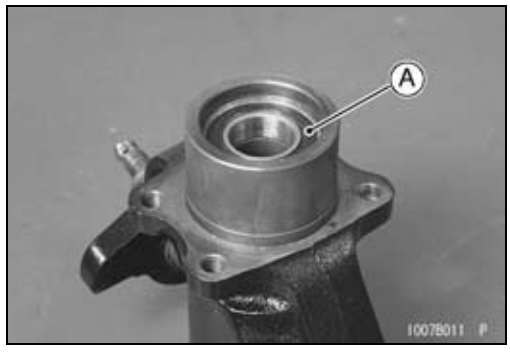
Knuckle Bearing Removal

- Remove:
  Steering Knuckle (see Steering Knuckle Removal)
  Grease Seal [A]



- Drive the bearing [A] out using a suitable bearing driver from the bearing driver set.

  Special Tool - Bearing Driver Set: 57001-1129

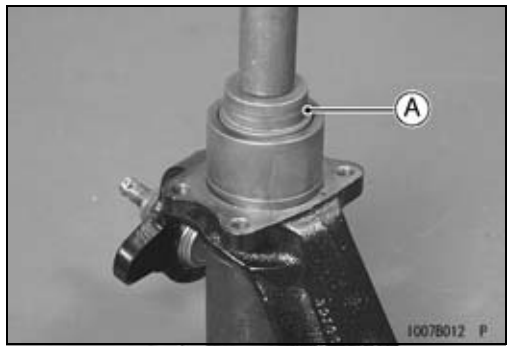


Knuckle Bearing Installation

- Press in the bearing until it is bottomed.

  Special Tool - Bearing Driver Set [A]: 57001-1129

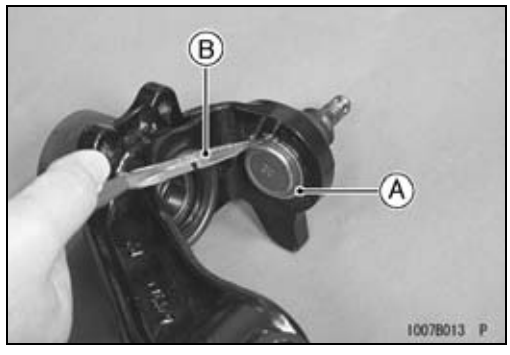
- Replace the grease seal with a new one.



Knuckle Joint Removal

- Remove:
  Steering Knuckle (see Steering Knuckle Removal)
  Circlip [A]

  Special Tool - Outside Circlip Pliers [B]: 57001-144

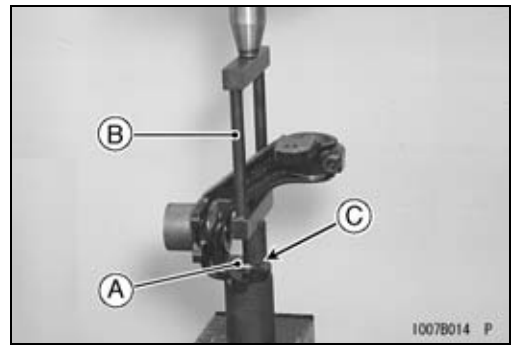


Steering Knuckles

● Remove the knuckle joint [A] using a press.

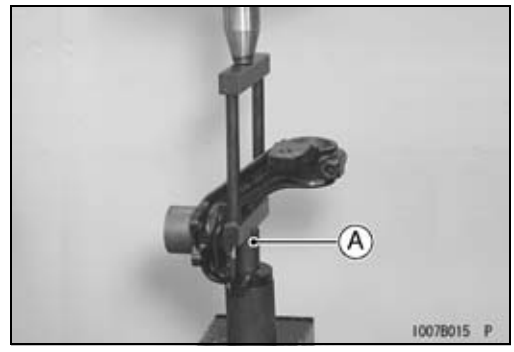
Special Tool - Knuckle Joint Remover [B]: 57001-1619

○First, press the knuckle joint until the remover end [C] touches the knuckle.



○Second, move the remover [A] so that its center align with the center of the knuckle joint.

○Press the knuckle joint, and remove it.



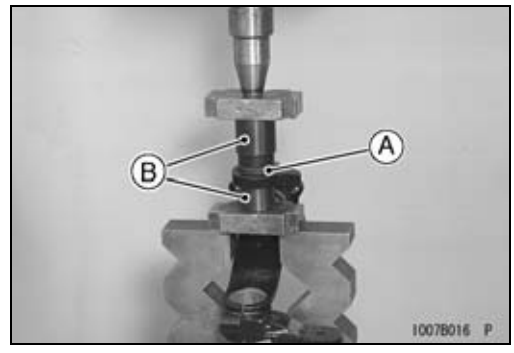
Knuckle Joint Installation

● Press the knuckle joint [A] until it is bottomed.

Special Tool - Knuckle Joint Driver [B]: 57001-1640

● Replace the circlip with a new one.

Special Tool - Outside Circlip Pliers: 57001-144



EPS (Electric Power Steering) System

Parts Location

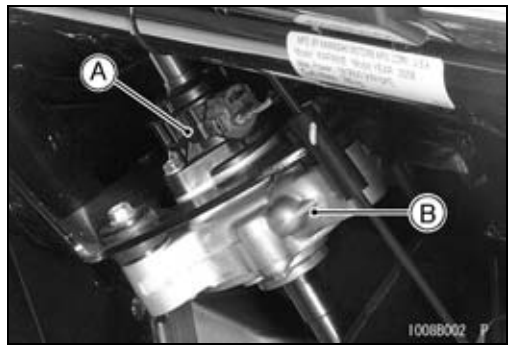
EPS Warning Indicator Light (LED) [A]



EPS Motor [A]



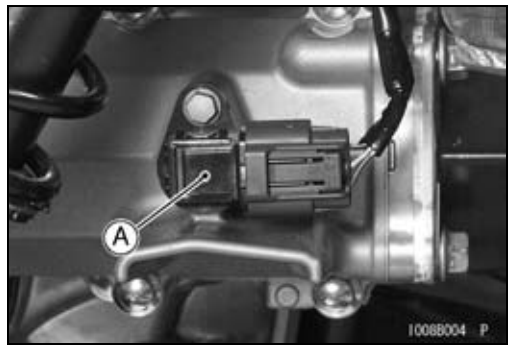
EPS Torque Sensor [A]
EPS Unit [B] (with EPS Motor and EPS Torque Sensor)



EPS ECU [A]

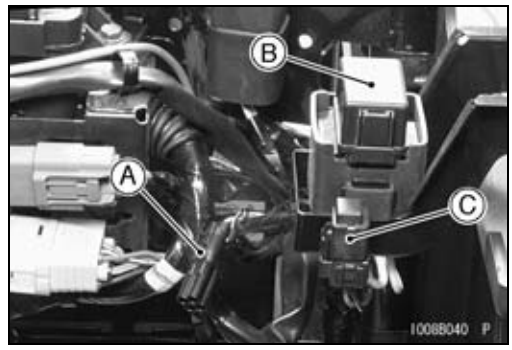


Speed Sensor [A]

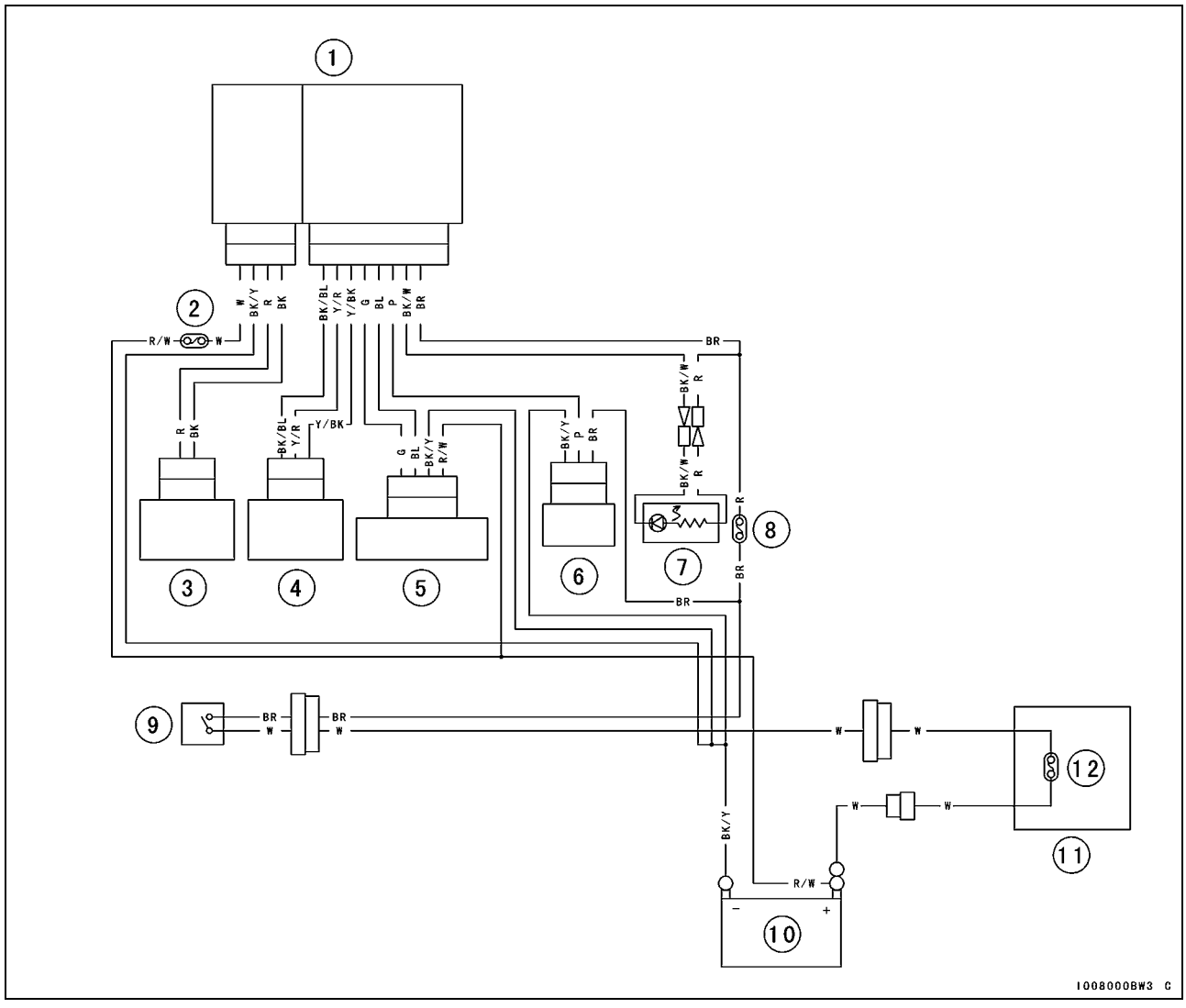


EPS (Electric Power Steering) System

EPS Self-diagnosis System Connector [A]
EPS Fuse Box 1 (40 A EPS Fuse) [B]
EPS Fuse Box 2 (7.5 A EPS Fuse) [C]



EPS System Wiring Diagram



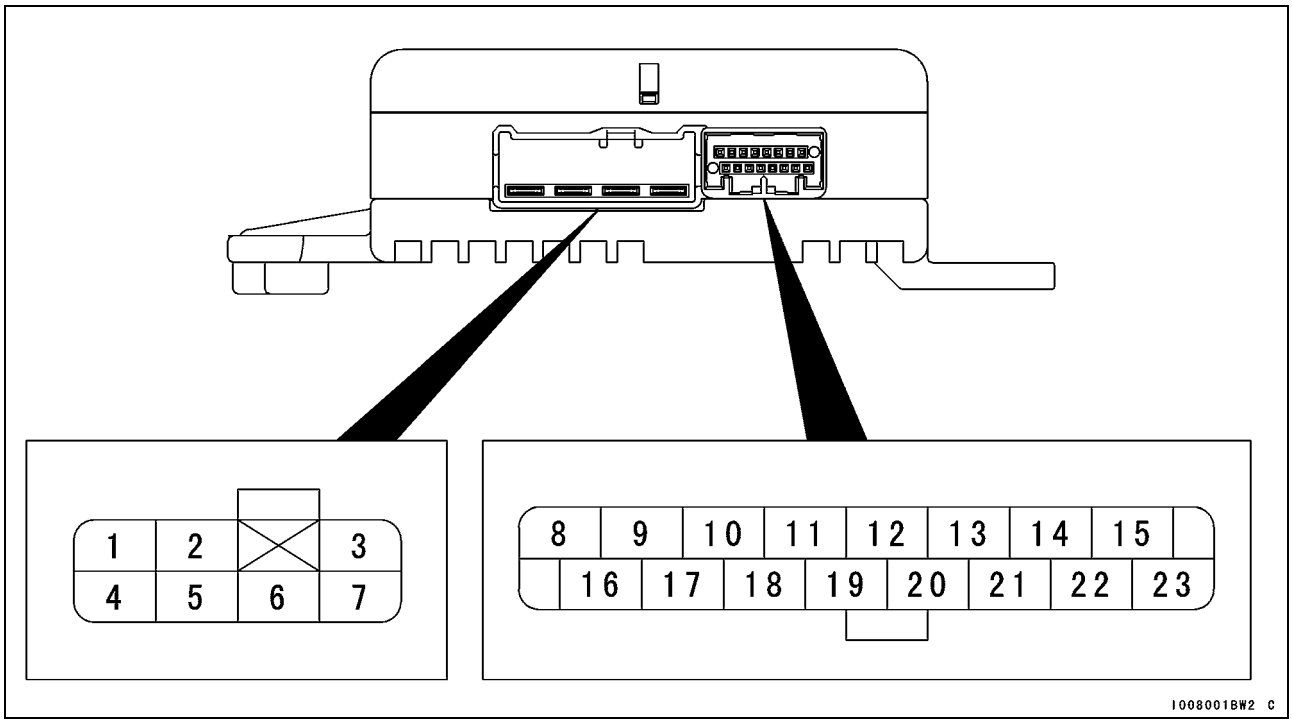
1. EPS ECU
2. 40 A EPS Fuse
3. EPS Motor
4. EPS Torque Sensor
5. EPS Self-diagnosis System Connector
6. Speed Sensor
7. EPS Warning Indicator Light (LED)
8. 7.5 A EPS Fuse
9. Main Switch
10. Battery 12 V 52 Ah
11. Fuse Box
12. 30 A Fuse

○Color Codes:

BK: Black	P: Pink
BL: Blue	R: Red
BR: Brown	W: White
G: Green	Y: Yellow

EPS (Electric Power Steering) System

Terminal Names



1. Unused
2. Unused
3. Unused
4. Ground for EPS ECU: BK/Y
5. Power Supply (from Battery): W
6. EPS Motor 1 : BK
7. EPS Motor 2 : R
8. External Communication Line: G
9. EPS Warning Indicator Light (LED): BK/W
10. Unused
11. Unused
12. Speed Sensor Signal: P
13. Unused
14. Unused
15. EPS Torque Sensor Signal 1: Y/BK
16. Power Supply (from Main Switch): BR
17. Unused
18. Unused
19. Unused
20. EPS Self-diagnosis System Terminal: BL
21. Unused
22. Ground for EPS Torque Sensor: BK/BL
23. EPS Torque Sensor Signal 2: Y/R

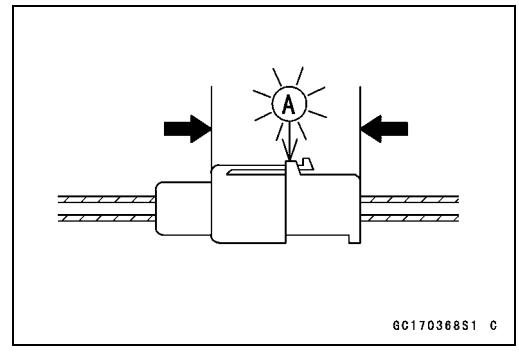
EPS (Electric Power Steering) System

EPS System Servicing Precautions

There are number of important precautions that should be followed servicing the EPS system.

- This EPS system is designed to be used with a 12 V battery as its power source. Do not use any other battery except for a 12 V battery as a power source.
- Do not reverse the battery cable connections. This will damage the EPS ECU.
- To prevent damage to the EPS system parts, do not disconnect the battery cables or any other electrical connections when the main switch ON or while the engine is running.
- Do not short the cables that are directly connected to the battery positive (+) terminal to the chassis ground.
- Do not turn the main switch ON while any of the EPS electrical connectors are disconnected. The EPS ECU memorizes service codes.
- Do not spray water on the electrical system parts, EPS system parts, connectors, leads and wiring.
- If a transceiver is installed on the vehicle, make sure that operation of the EPS system is not influenced by electric wave radiated from the antenna. Locate the antenna as far as possible away from the EPS ECU.

- Whenever the electrical connections of the EPS system are to be disconnected, first turn the main switch OFF. Conversely, make sure that all the electrical connections of the EPS system are firmly reconnected before turning on the main switch.
- When reconnecting the connector, connect these connectors securely until they click [A].



- The EPS system parts should never be struck sharply, as with a hummer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- The EPS system parts can not be disassembled. Even if a fault is found, do not try to disassemble and repair the EPS system parts, replace it.
- With the main switch ON and the engine not running, do not turn the steering wheel continuously for any length of time. The EPS system keeps operating and the battery may be discharged.
- With the front wheel lifted from the ground, do not move the front wheel quickly. An abnormal voltage is generated and the EPS ECU may be damaged.
- Using a fully charged battery. If the power supply voltage of the EPS ECU becomes 10 V or less, EPS system does not operate correctly.

EPS (Electric Power Steering) System

○There are 40 A and 7.5 A fuses for the EPS system. If the fuse is blown, the EPS system does not operate. In this case, the EPS warning indicator light (LED) does not light up and even if main switch is turned ON. Replace the fuse.

⚠ WARNING

When replacing the 40 A fuse, first disconnect the battery cables to avoid electrical shock.

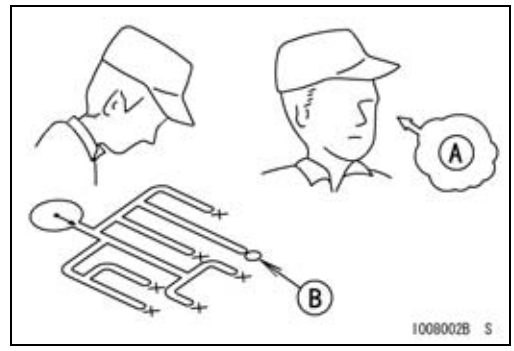
○If the EPS system fuses are blown frequently, inspect the EPS system parts.
○If the EPS ECU was replaced, be sure to register the EPS neutral position (see EPS Neutral Position Registration). The EPS system can not function until the neutral position is registered in the new EPS ECU. In this case, the EPS warning indicator light (LED) blinks immediately after main switch ON.
○If the following parts were removed or replaced, be sure to register the neutral position of the EPS (see EPS Neutral Position Registration). If the neutral position does not register, EPS system does not operate correctly.
EPS Unit
Upper and Lower Universal Joints
Steering Gear Assembly
Steering Knuckles
○Do not loosen the following bolts and nuts except repair work. If the following bolts and nuts were loosened, be sure to register the EPS neutral position (see EPS Neutral Position Registration). If the neutral position does not register, EPS system does not operate correctly.
Steering Gear Assembly Bracket Bolts
Tie-Rod End Nuts
Universal Joint Clamp Bolts
EPS Unit Mounting Bolts
○Before delivering the vehicle to the customer, be sure to erase any service codes which might be stored in the EPS ECU. Using the self-diagnosis function, confirm that the EPS warning indicator light (LED) lights up (This shows that there is no service code in the EPS ECU.).

EPS System Troubleshooting Outline

The EPS ECU is equipped with a self-diagnosis function. When an abnormality in the EPS system occurs, the EPS ECU lights the EPS warning indicator light (LED) [A] to alert the rider. In addition, the condition of the problem is stored in the memory of the EPS ECU as service codes and in the self-diagnosis mode, the service code is indicated by the number of times the EPS warning indicator light (LED) blinks.



EPS (Electric Power Steering) System



If due to a malfunction, the EPS warning indicator light (LED) remains lit, try to understand the background of the trouble before starting the repair work. First ask the rider about the conditions [A] of the trouble, and then start to examine the cause [B] of the trouble. Do not rely solely on the self-diagnosis function, use common sense; for example, check the connections of the connector.

If the problem is with the following parts, the EPS ECU can not recognize these problem. Therefore, EPS warning indicator light (LED) does not light up, and service code is not indicated.

EPS Warning Indicator Light (LED)
EPS ECU Power Source Wiring and Ground Wiring
Speed Sensor

When the repair has been done, the EPS warning indicator light (LED) lights up immediately after main switch ON, and goes off after 1 second. This shows that EPS system is normal. But, service codes detected once by the EPS ECU will be memorized in the EPS ECU. Therefore, after maintenance work ends, be sure to erase the service codes with service code erase mode. Do not erase the service codes during troubleshooting. Wait until all the checks and repair work are finished to prevent duplication of previous service codes and unnecessary maintenance work. Before erasing the service codes, record them as problem history. The problem history can be referred when solving unstable trouble.

Even when the EPS system is operating normally, the EPS warning indicator light (LED) may light up under strong electrical interference. If the indicator light lights up, turn the main switch OFF and then erase the service code.

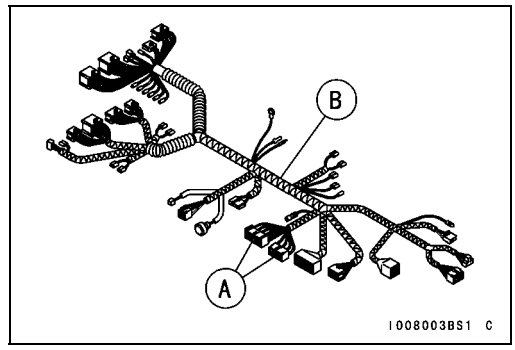
Much of the EPS system troubleshooting work consists of confirming continuity of the wiring. The EPS system parts are assembled and adjusted by the manufacturer, so there is no need to disassemble or repair them. Replace them as an assembly.

The basic troubleshooting procedures and precautions are listed below.

- Using a fully charged battery. A fully charged battery is a must for conducting reliable self-diagnosis function.
- Measure coil winding resistance when the EPS system part is cold (at room temperature).
- Check wiring and connections from the EPS ECU connector to the suspected faulty EPS system part, using the hand tester.

Special Tool - Hand Tester: 57001-1394

EPS (Electric Power Steering) System



- Visually inspect the wiring for signs of burning or fraying.
★If any wiring is poor, replace the damaged wiring.
- Pull each connector [A] apart and inspect it for corrosion, dirt and damage.
★If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.
- Check the wiring for continuity.
○Use the wiring diagram to find the ends of the lead which is suspected of being problem.
○Connect the hand tester between the ends of the leads.

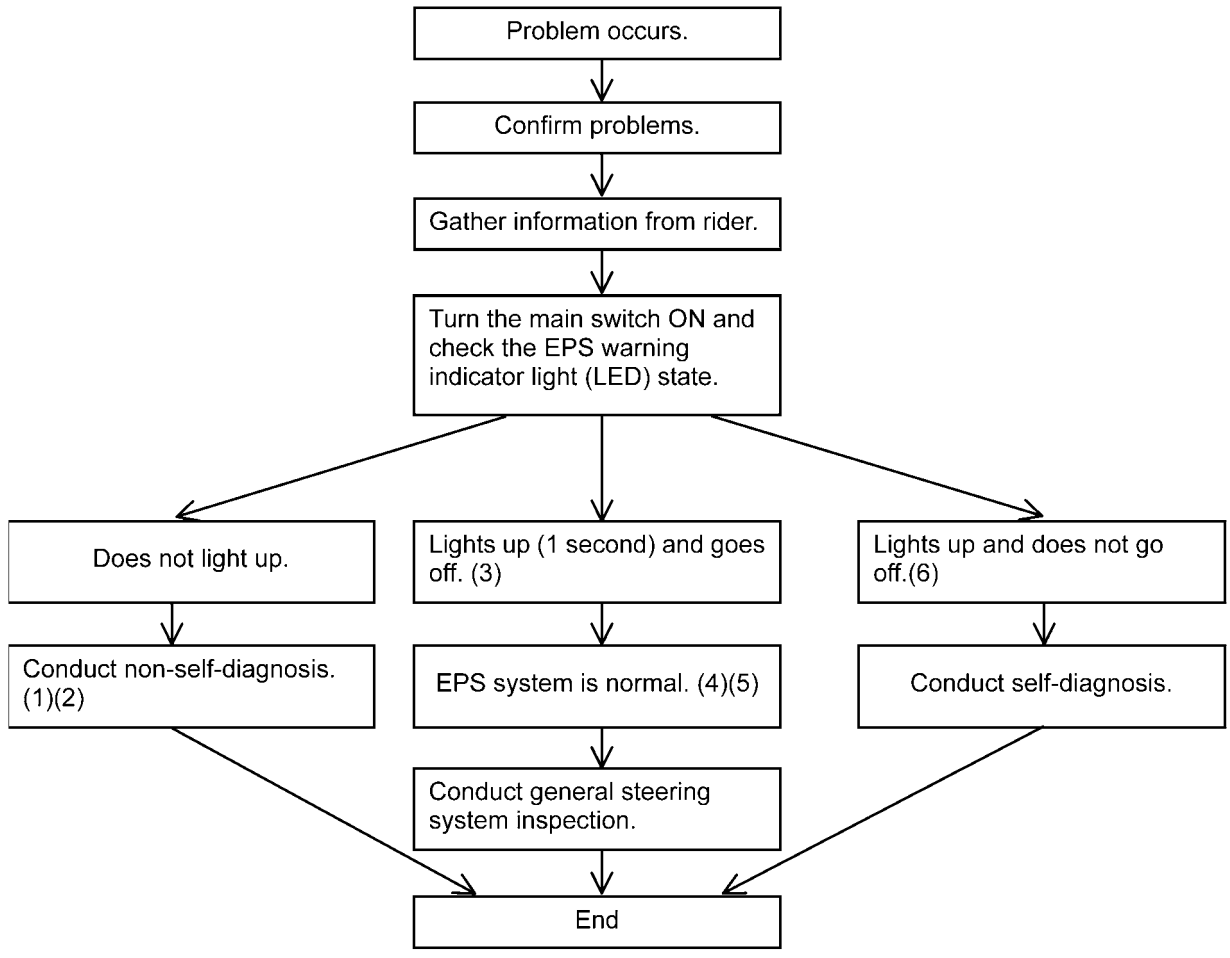
Special Tool - Hand Tester: 57001-1394

○Set the hand tester to the × 1 Ω range, and read the tester.
★If the tester does not read 0 Ω, the lead is defective. Replace the main harness [B] if necessary.

- Narrow down suspicious parts and close in on the faulty EPS system part by repeating the continuity tests.
★If no abnormality is found in the wiring or connectors, the EPS system parts are the next likely suspects. Check each part one by one.
★If an abnormality is found, replace the affected EPS system part.
★If all the parts and wirings are good, be sure to inspect the power supply voltage of the EPS ECU.
★If the power supply voltage is good, replace the EPS ECU.

EPS (Electric Power Steering) System

EPS System Diagnosis Flow Chart


Problem occurs.
Confirm problems.
Gather information from rider.
Turn the main switch ON and check the EPS warning indicator light (LED) state.
Does not light up.
Lights up (1 second) and goes off. (3)
Lights up and does not go off.(6)
Conduct non-self-diagnosis. (1)(2)
EPS system is normal. (4)(5)
Conduct self-diagnosis.
Conduct general steering system inspection.
End

General Steering System :
Steering Wheel, Steering Shaft, Steering Gear Assembly, Steering Knuckle, etc.

NOTE:

(1): If the EPS warning indicator light (LED) does not light up even if the main switch is turned ON, but the EPS motor is operating, inspect the EPS warning indicator light(LED).

(2): If the EPS warning indicator light (LED) does not light even if the main switch is turned ON, and the EPS motor does not operate, inspect the EPS ECU power source wiring and ground wiring.

(3): The EPS motor does not operate while the EPS warning indicator light (LED) lights up for 1second.

(4): If the steering wheel becomes too light while the vehicle is running, inspect the speed sensor.

(5): When the vehicle is idling or low speed condition and if the steering wheel is operated as follows, the steering wheel may become heavy.

○Turn the steering wheel fully to both sides continuously for a long time.

○Turn the steering wheel fully and keeps it for a long time.

In these cases, the EPS ECU reduces the current to the EPS motor to protect the EPS motor from overheating. Therefore, this is not trouble. Free the hands from the steering wheel and only have to wait for a while.

(6): The EPS warning indicator light (LED) might go off by the following operation.

○Turn the main switch OFF, and turn it ON again.

If the indicator light (LED) goes off, it is a temporary failure. Therefore, erase the service code memorized in the EPS ECU with the service code erase mode.

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EPS (Electric Power Steering) System

Inquiries to Rider

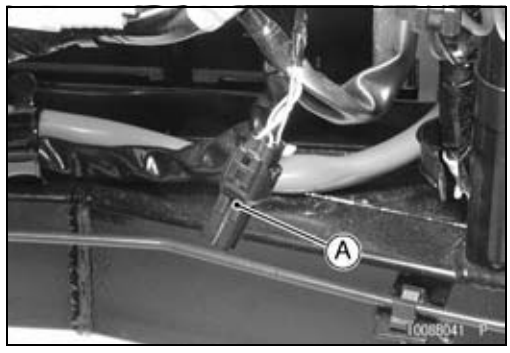
- ○Each rider reacts to problems in different ways, so it is important to confirm what kind of condition the rider is dissatisfied with.
- ○Try to find out exactly what problem occurs under exactly what conditions by asking the rider; knowing this information may help you reproduce the problem in the shop.
- ○The following sample diagnosis sheet will help prevent you from overlooking any keys, so always use it.

Sample Diagnosis Sheet

Rider name:		Registration No. (license plate No.):
Year of initial registration:		Model:
Engine No.:		Frame No.:
Date problem occurred:		Problem frequency:
Weather:		Mileage:
Phenomenon	☐ Steering wheel is heavy.	
	☐ Steering wheel is too light.	
	☐ Steering wheel is unbalance.	
	☐ Steering wheel is naturally turned to one side.	
	☐ When operating the steering wheel, make vibration or noise.	
	☐ When operating the steering wheel, the headlight darkens.	
	☐ EPS system does not operate.	
	☐ Other	
Engine conditions at problem	☐ At start-up	☐ After starting
Driving conditions	☐ At high-speed	☐ At low-speed
EPS warning indicator light (LED) conditions	☐ lights up immediately after main switch ON, and goes off after 1 second.	
	☐ lights up immediately after main switch ON, and stays on.	
	☐ Blinks immediately after main switch ON, and stays on.	
	☐ Does not light up.	
	☐ Sometimes lights up.	

Self-diagnosis Outline

The EPS self-diagnosis system has two modes and can be switched to another mode by connecting terminals of the EPS self-diagnosis system connector [A].



User Mode

The EPS ECU notifies the rider of troubles in EPS system by lighting the EPS warning indicator light (LED) when EPS system parts are faulty, and initiates fail-safe function. In this case, EPS ECU stops the EPS motor operation.

Dealer Mode

The EPS warning indicator light (LED) emits service code (s) to show the problem (s) by blinking.

EPS (Electric Power Steering) System

Self-diagnosis Procedure

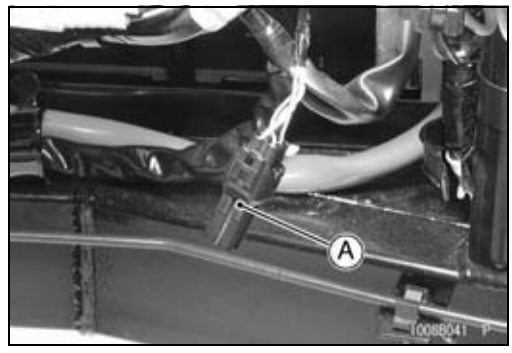


○When problem occurs with the EPS system, the EPS warning indicator light (LED) [A] lights up.

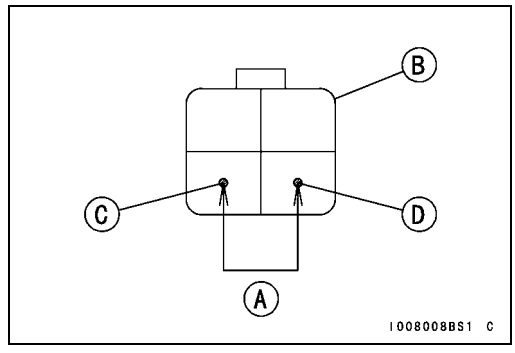
NOTE

○*Use a fully charged battery when conducting self-diagnosis. Otherwise, the EPS warning indicator light (LED) blinks very slowly or does not blink.*

○*Keep the EPS self-diagnosis system connector terminals connected during self-diagnosis, with an auxiliary lead.*



● Turn the main switch OFF.
● Tilt up the seat.
● Disconnect the EPS self-diagnosis system connector [A].



● Connect an auxiliary lead [A] to the terminals of the EPS self-diagnosis system connector [B] as shown.

Auxiliary Lead Connections:
BL Lead [C] ←→ BK/Y Lead [D]

○The BK/Y lead terminal is connected to the battery (–) terminal.
● Turn the main switch ON.
● Count the blinks of the indicator light to read the service code (see Service Code Reading).

NOTE

○*Keep connections of the auxiliary lead until you finish reading the service code.*

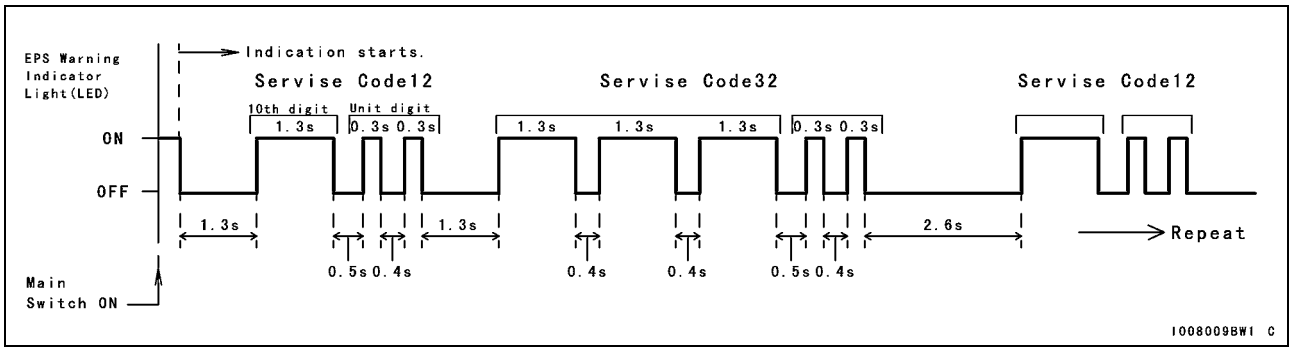
○*If there is no service code, the EPS warning indicator light (LED) remains lit and service code is not indicated.*

● Any of the following procedures ends the self-diagnosis mode.
○When the main switch is turned OFF.
○When the auxiliary lead is disconnected from the terminals of the EPS self-diagnosis system connector.

EPS (Electric Power Steering) System

Service Code Reading

○Service codes are shown by a series of long and short blinks of the EPS warning indicator light (LED) as shown below.
○Read 10th digit and unit digit as the EPS warning indicator light (LED) blinks.
○The EPS ECU can memorize all the service codes except the service code 31.
○When there are plural service codes in the memory of the EPS ECU, the service codes are displayed from the lowest number code in the ascending order. The display is repeated until the main switch is turned OFF or the auxiliary lead is disconnected from the terminals of the EPS self-diagnosis system connector.
○For example, if two problems occurred in the order of 32,12, the service codes are displayed from the lowest number code in the order listed.
(12→32) → (12→32) →· · · (repeated)

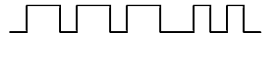
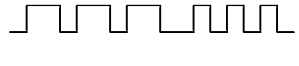
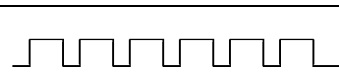


Service Code Erasing

○The service code memorized in the EPS ECU can not be erased even if the main switch is turned OFF or battery cables are disconnected.
○Refer to the Service Code Erasing Procedure for the service code erasure.

EPS (Electric Power Steering) System

Service Code Table

Service Code	EPS Warning Indicator Light (LED)	Failure Parts	Problems
11		–	Power supply voltage from main switch is abnormal.
12		–	Power supply voltage from battery is abnormal.
31 (1)		–	EPS neutral position is unregistration.
32		EPS ECU	Current sensor is trouble.
33			FET(Field Effect Transistor) for EPS motor is trouble.
34			Internal relay is trouble.
35			CPU (Central Processing Unit) is trouble.
36			Direction distinction circuit for EPS torque sensor is trouble.
37			Boosting transformer circuit is trouble.
51		EPS Unit	EPS torque sensor is trouble.
61			EPS motor is trouble.

NOTE:

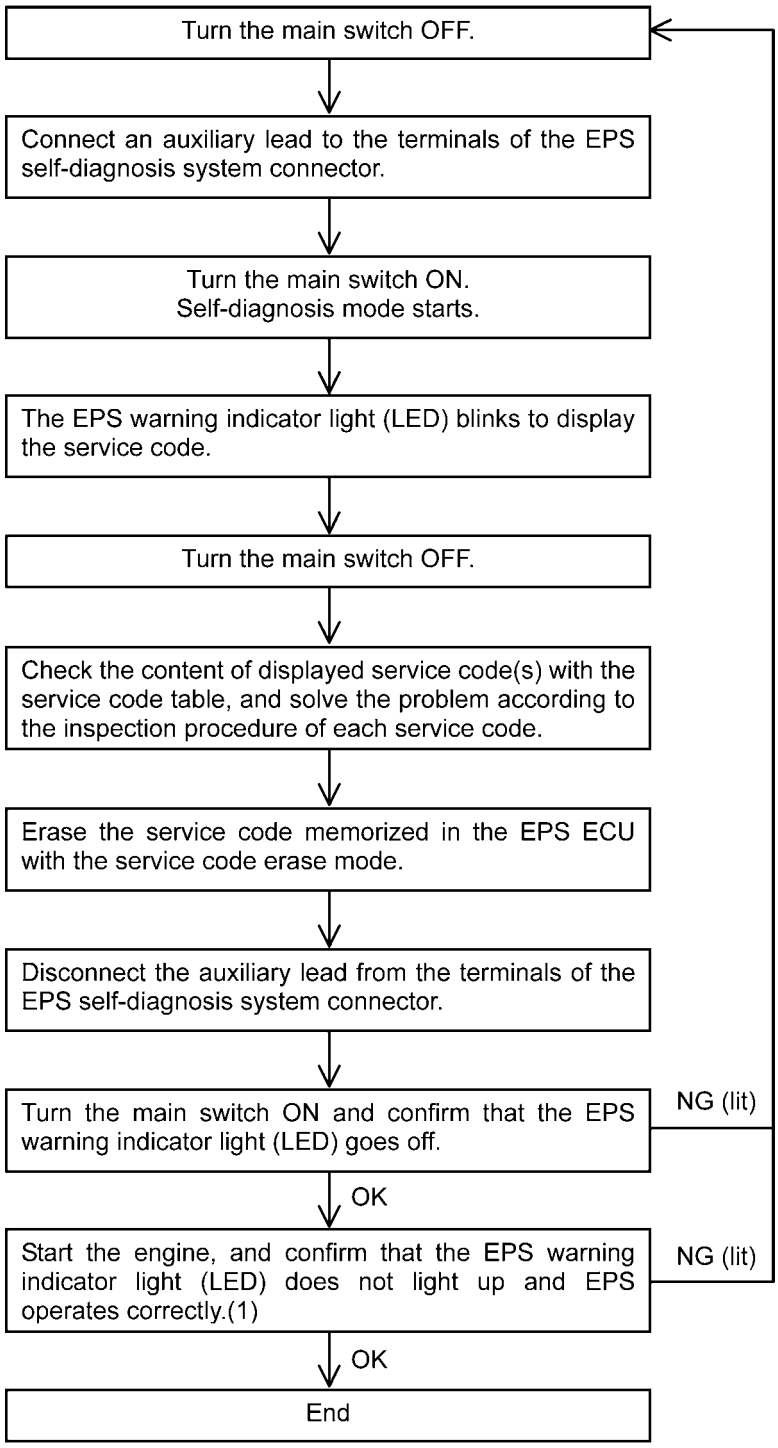
(1): This code appears in the following condition.

○When the EPS ECU was replaced and the EPS neutral position is not registered in the new EPS ECU.

In this case, the EPS warning indicator light (LED) blinks immediately after main switch ON. But, the service code 31 is not memorized in the EPS ECU. Therefore, the service code 31 will disappear when the EPS neutral position was registered in the new EPS ECU.

EPS (Electric Power Steering) System

Self-diagnosis Flow Chart


Turn the main switch OFF.
Connect an auxiliary lead to the terminals of the EPS self-diagnosis system connector.
Turn the main switch ON.
Self-diagnosis mode starts.
The EPS warning indicator light (LED) blinks to display the service code.
Turn the main switch OFF.
Check the content of displayed service code(s) with the service code table, and solve the problem according to the inspection procedure of each service code.
Erase the service code memorized in the EPS ECU with the service code erase mode.
Disconnect the auxiliary lead from the terminals of the EPS self-diagnosis system connector.
Turn the main switch ON and confirm that the EPS warning indicator light (LED) goes off.
NG (lit)
OK
Start the engine, and confirm that the EPS warning indicator light (LED) does not light up and EPS operates correctly.(1)
NG (lit)
OK
End

NOTE:
(1): The EPS warning indicator light (LED) may light up if the power supply of the EPS system becomes 10V or less condition for 20 seconds or more (For example, when starting the engine.).

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EPS (Electric Power Steering) System

Service Code Erasing Procedures

NOTE

- ○*Keep the self-diagnosis system connector terminals connected during service code erase mode with an auxiliary lead.*
- ○*The EPS motor does not operate during service code erase mode.*

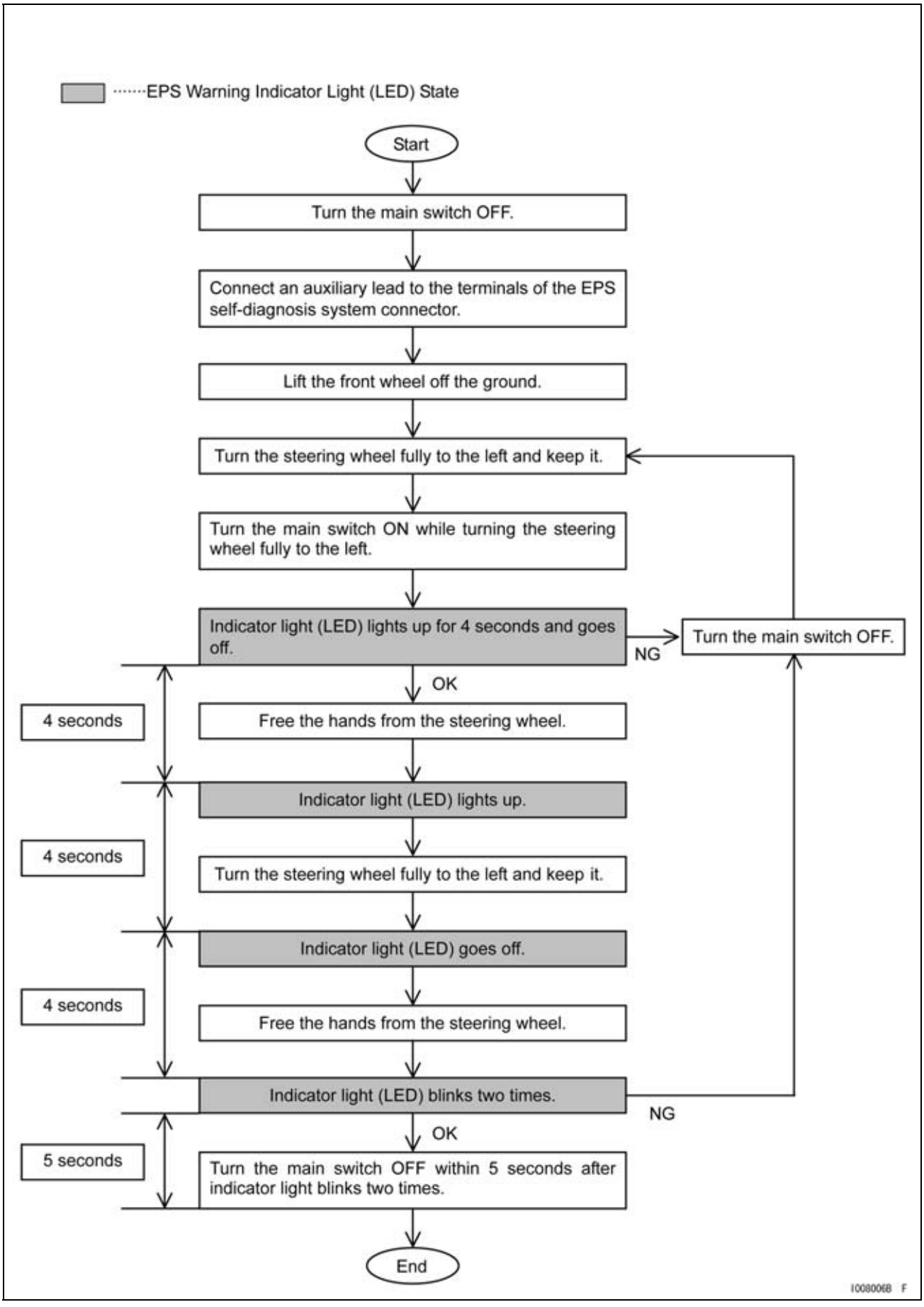
● Start the service code erase mode with the following procedure.
○First, turn the main switch OFF.
○Second, connect an auxiliary lead to the terminals of the EPS self-diagnosis system connector by the same procedure as self-diagnosis mode (see Self-diagnosis Procedure).
○Third, lift the front wheel off the ground.
○Fourth, turn the steering wheel fully to the left and keep it.
○Fifth, turn the main switch ON while turning the steering wheel fully to the left.
○The EPS warning indicator light (LED) ights up for 4 seconds and goes off.
★If the service code is indicated, turn the main switch OFF and repeat from fourth procedure again.
○Sixth, free the hands from the steering wheel after indicator light goes off.
○After 4 seconds, the EPS warning indicator light (LED) lights up.
○Seventh, turn the steering wheel fully to the left and keep it, after indicator light lights up.
○After 4 seconds, the EPS warning indicator light (LED) goes off.
○Eighth, free the hands from the steering wheel after indicator light goes off.
○After 4 seconds, the EPS warning indicator light (LED) blinks two times. This blink shows that the service code was erased.
★If the EPS warning indicator light (LED) does not blink or lights up, turn the main switch OFF and repeat from fourth procedure again.
○Lastly, turn the main switch OFF within 5 seconds after indicator light blinks two times, end the service code erase mode.
★If the main switch is not turned OFF within 5 seconds, the EPS ECU starts the EPS neutral position registration.

NOTE

- ○*The EPS neutral position registration is same procedure as until eighth procedure.*
- ○*After finishing the service code erase mode, enter the self-diagnosis mode again to confirm that the service codes have been erased. If all codes have been erased, the EPS warning indicator light (LED) remains lit and service code is not indicated.*

EPS (Electric Power Steering) System

Service Code Erasing Flow Chart


·····EPS Warning Indicator Light (LED) State
Start
Turn the main switch OFF.
Connect an auxiliary lead to the terminals of the EPS self-diagnosis system connector.
Lift the front wheel off the ground.
Turn the steering wheel fully to the left and keep it.
Turn the main switch ON while turning the steering wheel fully to the left.
Indicator light (LED) lights up for 4 seconds and goes off.
NG
Turn the main switch OFF.
OK
4 seconds
Free the hands from the steering wheel.
Indicator light (LED) lights up.
4 seconds
Turn the steering wheel fully to the left and keep it.
Indicator light (LED) goes off.
4 seconds
Free the hands from the steering wheel.
Indicator light (LED) blinks two times.
NG
OK
5 seconds
Turn the main switch OFF within 5 seconds after indicator light blinks two times.
End
I0080068 F

EPS (Electric Power Steering) System

EPS Neutral Position Registration

NOTE

○*Keep the self-diagnosis system connector terminals connected during the EPS neutral position registration with an auxiliary lead.*
○*Be sure to lift the front wheel off the ground. The EPS neutral position can not be registered correctly with the front wheel on the ground.*
○*The EPS motor does not operate during EPS neutral position registration.*

● Register the EPS neutral position with the following procedure.
○First, turn the main switch OFF.
○Second, connect an auxiliary lead to the terminals of the EPS self-diagnosis system connector by the same procedure as self-diagnosis mode (see Self-diagnosis Procedure).
○Third, lift the front wheel off the ground.
○Fourth, turn the steering wheel fully to the left and keep it.
○Fifth, turn the main switch ON while turning the steering wheel fully to the left.
○The EPS warning indicator light (LED) ights up for 4 seconds and goes off.
★If the EPS warning indicator light (LED) remains lit or blinks, turn the main switch OFF and repeat from fourth procedure again.
○Sixth, free the hands from the steering wheel after indicator light goes off.
○After 4 seconds, the EPS warning indicator light (LED) lights up.
○Seventh, turn the steering wheel fully to the left and keep it, after indicator light lights up.
○After 4 seconds, the EPS warning indicator light (LED) goes off.
○Eighth, free the hands from the steering wheel after indicator light goes off.
○After 4 seconds, the EPS warning indicator light (LED) blinks two times. This blink shows that the service code in the EPS ECU was erased.
★If the EPS warning indicator light (LED) does not blink or lights up, turn the main switch OFF and repeat from fourth procedure again.

NOTE

○*The service code erase is same procedure as until eighth procedure.*

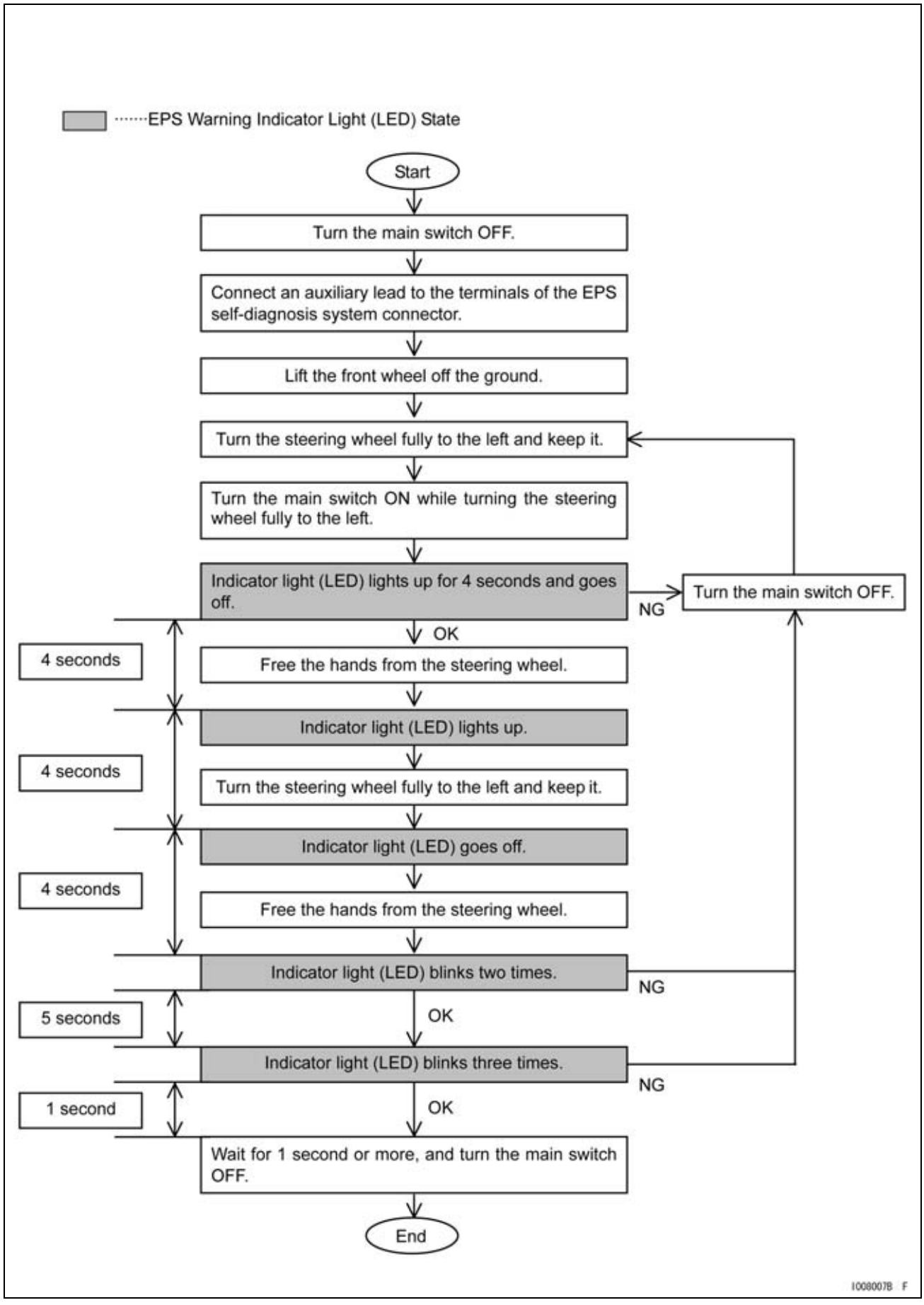
EPS (Electric Power Steering) System

○Ninth, wait for 5 seconds after indicator light blinks two times.
○After 5 seconds, the EPS warning indicator light (LED) blinks three times. This blink shows that the EPS neutral position was registered.
★If the EPS warning indicator light (LED) does not blink, turn the main switch OFF and repeat from fourth procedure again.
○Lastly, wait for 1 second or more after indicator light blinks three times and turn the main switch OFF.

- Disconnect the auxiliary lead from the terminals of the self-diagnosis system connector.
- Turn the main switch ON and confirm that the EPS warning indicator light (LED) lights up for 1 second and goes off.
- Start the engine, and confirm that the EPS operates correctly.

EPS (Electric Power Steering) System

EPS Neutral Position Registration Flow Chart


·····EPS Warning Indicator Light (LED) State
Start
Turn the main switch OFF.
Connect an auxiliary lead to the terminals of the EPS self-diagnosis system connector.
Lift the front wheel off the ground.
Turn the steering wheel fully to the left and keep it.
Turn the main switch ON while turning the steering wheel fully to the left.
Indicator light (LED) lights up for 4 seconds and goes off.
NG
Turn the main switch OFF.
OK
4 seconds
Free the hands from the steering wheel.
Indicator light (LED) lights up.
4 seconds
Turn the steering wheel fully to the left and keep it.
Indicator light (LED) goes off.
4 seconds
Free the hands from the steering wheel.
Indicator light (LED) blinks two times.
NG
5 seconds
OK
Indicator light (LED) blinks three times.
NG
1 second
OK
Wait for 1 second or more, and turn the main switch OFF.
End
I008007B F

EPS (Electric Power Steering) System

Power Supply Voltage Abnormal (Service Code 11,12)

○The usable range of the power supply voltage is 10 V to 16 V.

● Check the charging condition (see Alternator Operation Inspection in the Electrical System chapter).

★If the charging condition is normal, check the power supply voltage (see EPS ECU Power Supply Voltage Inspection).

★If the power supply voltage is good, but the problem still exists, replace the EPS ECU (see EPS ECU Removal/Installation).

EPS Neutral Position Unregistration (Service Code 31)

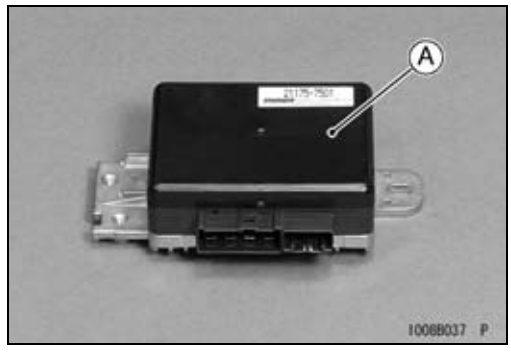
○This code appears in the following condition.

○When the EPS ECU was replaced and the EPS neutral position is not registered in the new EPS ECU.

● Register the EPS neutral position in the new EPS ECU (see EPS Neutral Position Registration).

Current Sensor Inspection (Service Code 32)

○The current sensor is built in the EPS ECU [A]. So, the current sensor itself can not be inspected.



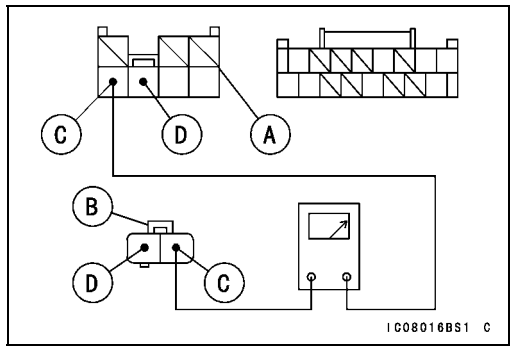
● Turn the main switch OFF.

● Disconnect the EPS ECU and EPS motor connectors.

● Check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

Wiring Continuity Inspection
EPS ECU Connector [A] ⟷
EPS Motor Connector [B]
R Lead [C]
BK Lead [D]

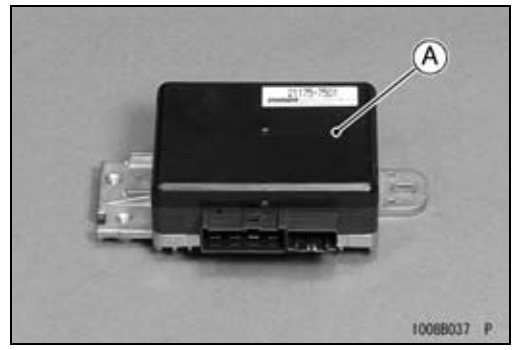


★If the wiring is good, check the power supply voltage (see EPS ECU Power Supply Voltage Inspection).

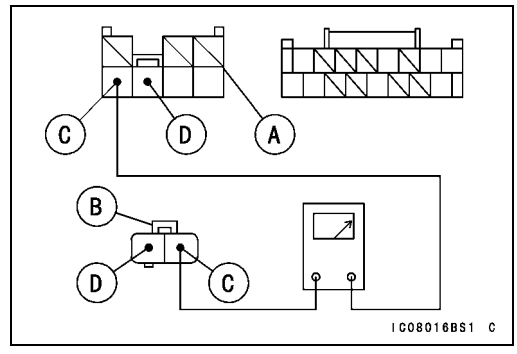
★If the power supply voltage is good, but the problem still exists, replace the EPS ECU (see EPS ECU Removal/Installation).

EPS (Electric Power Steering) System

FET (Field Effect Transistor) Inspection (Service Code 33)



○The FET is built in the EPS ECU [A]. So, the FET itself can not be inspected.



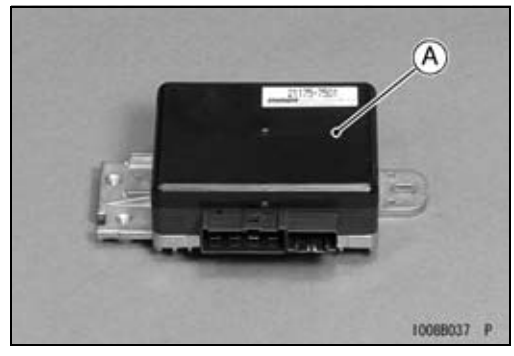
- Turn the main switch OFF.
- Disconnect the EPS ECU and EPS motor connectors.
- Check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

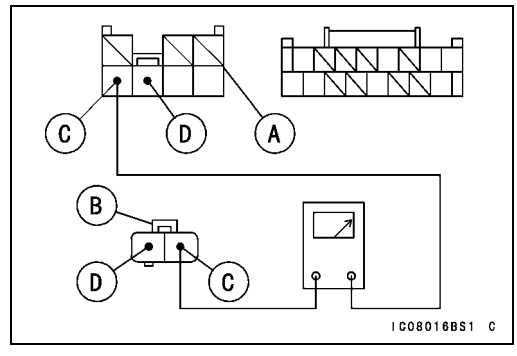
Wiring Continuity Inspection
EPS ECU Connector [A] ←→
EPS Motor Connector [B]
R Lead Terminal [C]
BK Lead Terminal [D]

★If the wiring is good, check the power supply voltage (see EPS ECU Power Supply Voltage Inspection).
★If the power supply voltage is good, but the problem still exists, replace the EPS ECU (see EPS ECU Removal/Installation).

Internal Relay Inspection (Service Code 34)



○The relay function is included in the EPS ECU [A]. So, the relay function can not be inspected.



- Turn the main switch OFF.
- Disconnect the EPS ECU and EPS motor connectors.
- Check the wiring for continuity between main harness connectors.

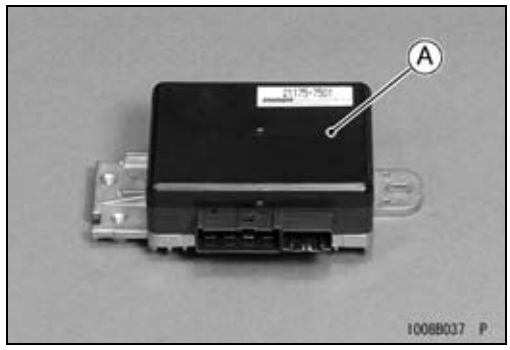
Special Tool - Hand Tester: 57001-1394

Wiring Continuity Inspection
EPS ECU Connector [A] ←→
EPS Motor Connector [B]
R Lead Terminal [C]
BK Lead Terminal [D]

★If the wiring is good, check the power supply voltage (see EPS ECU Power Supply Voltage Inspection).
★If the power supply voltage is good, but the problem still exists, replace the EPS ECU (see EPS ECU Removal/Installation).

EPS (Electric Power Steering) System

CPU (Central Processing Unit) Inspection (Service Code 35)

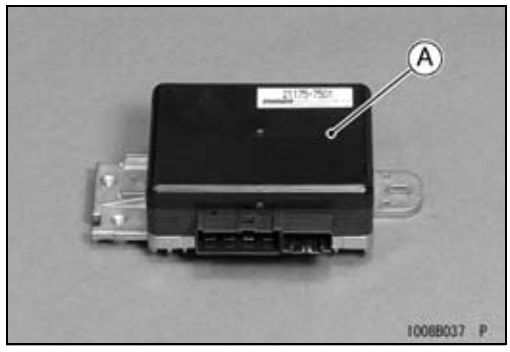


○The CPU is built in the EPS ECU [A]. So, the CPU itself can not be inspected.

- Check the power supply voltage (see EPS ECU Power Supply Voltage Inspection).

★If the power supply voltage is good, but the problem still exists, replace the EPS ECU (see EPS ECU Removal/Installation).

Direction Distinction Circuit Inspection (Service Code 36)

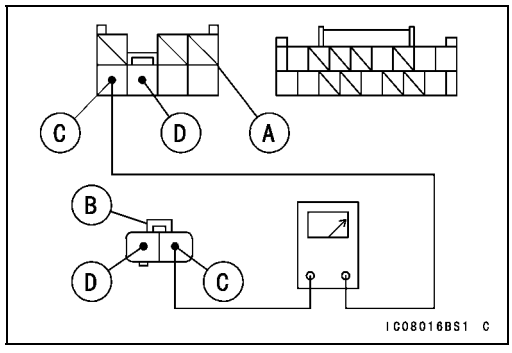


○The direction distinction circuit is built in the EPS ECU [A]. So, the direction distinction circuit itself can not be inspected.

- Turn the main switch OFF.
- Disconnect the EPS ECU and EPS motor connectors.
- Check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

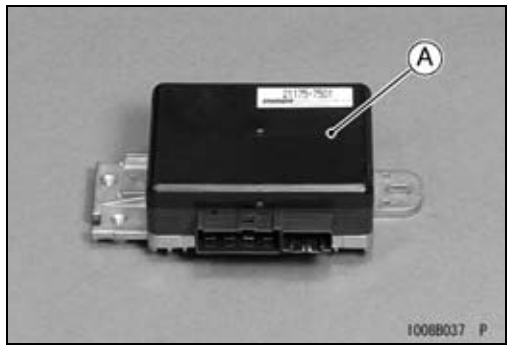
Wiring Continuity Inspection
EPS ECU Connector [A] ←→
EPS Motor Connector [B]
R Lead Terminal [C]
BK Lead Terminal [D]



★If the wiring is good, check the power supply voltage (see EPS ECU Power Supply Voltage Inspection).

★If the power supply voltage is good, but the problem still exists, replace the EPS ECU (see EPS ECU Removal/Installation).

Boosting Transformer Circuit Inspection (Service Code 37)



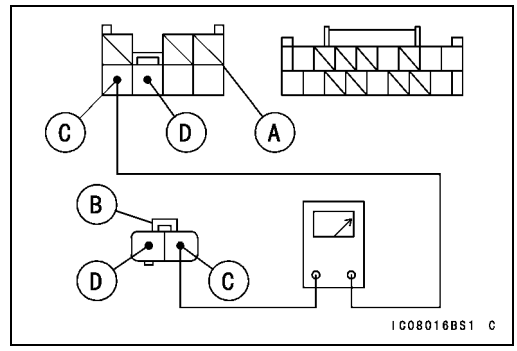
○The boosting transformer circuit is built in the EPS ECU [A]. So, the boosting transformer circuit itself can not be inspected.

EPS (Electric Power Steering) System

- Turn the main switch OFF.
- Disconnect the EPS ECU and EPS motor connectors.
- Check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

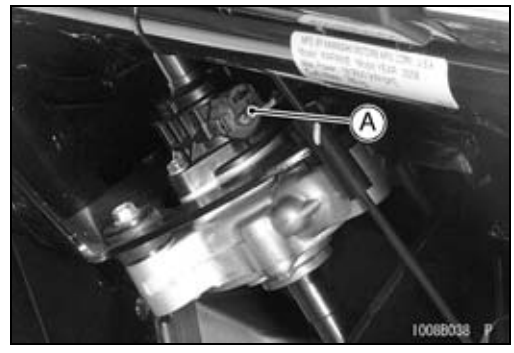
Wiring Continuity Inspection
EPS ECU Connector [A] ←→
EPS Motor Connector [B]
R Lead Terminal [C]
BK Lead Terminal [D]



★If the wiring is good, check the power supply voltage (see EPS ECU Power Supply Voltage Inspection).
★If the power supply voltage is good, but the problem still exists, replace the EPS ECU (see EPS ECU Removal/Installation).

EPS Torque Sensor Inspection (Service Code 51)

- Turn the main switch OFF.
- Disconnect the EPS torque sensor connector [A].



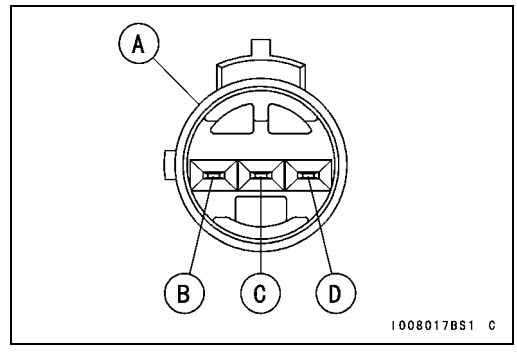
- Set the hand tester to the × 1Ω range and connect it to the EPS torque sensor connector [A].

Special Tool - Hand Tester: 57001-1394

- Measure the EPS torque sensor resistance.

EPS Torque Sensor Resistance Inspection
Connections:
(I) Y/BK Lead [B] ←→ BK/BL Lead [C]
(II) Y/R Lead [D] ←→ BK/BL Lead [C]

Standard:
Both Connections: Any Reading Resistance (reference 10 ~ 40 Ω at 20°C (68°F))



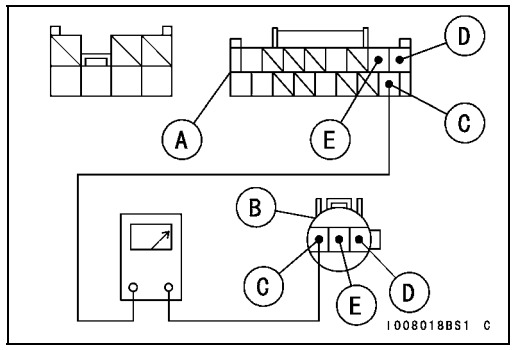
★If the reading is infinity (∞) Ω, replace the EPS unit (see EPS Unit Removal/Installation).

EPS (Electric Power Steering) System

★If the reading is in specification, disconnect the EPS ECU connectors and check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

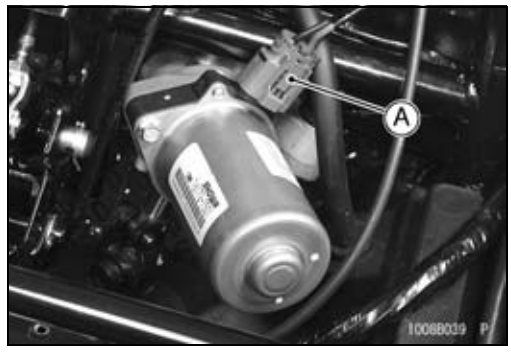
Wiring Continuity Inspection
EPS ECU Connector [A] ←→
EPS Torque Sensor Connector [B]
Y/BK Lead [C]
Y/R Lead [D]
BK/BL Lead [E]



★If the wiring is good, check the power supply voltage (see EPS ECU Power Supply Voltage Inspection).
★If the power supply voltage is good, erase the service code with the service code erase mode and enter the self -diagnosis mode again.
★If the service code 51 appears again, replace the EPS ECU (see EPS ECU Removal/Installation).
★If the service code 51 disappears, it is a temporary failure.

EPS Motor Inspection (Service Code 61)

- Remove the front cargo compartment (see Front Cargo Compartment in the Frame chapter).
- Turn the main switch OFF.
- Disconnect the EPS motor connector [A].

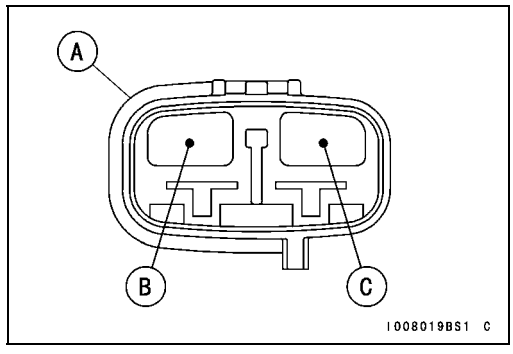


- Set the hand tester to the × 1Ω range and connect it to the EPS motor connector [A].

Special Tool - Hand Tester: 57001-1394

- Measure the EPS motor resistance.

EPS Motor Resistance Inspection
Connections: R Lead [B] ←→ BK Lead [C]
Standard: Any Reading Resistance (reference 0.15 ~ 0.19 Ω at 20°C (68°F))



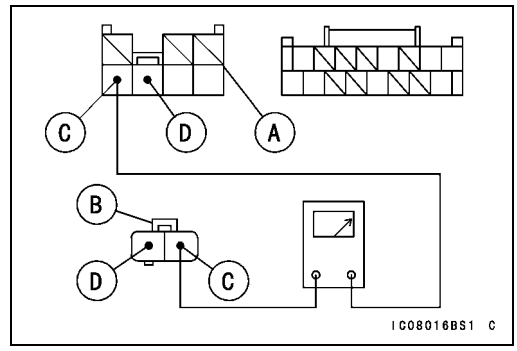
★If the reading is infinity (∞) Ω, replace the EPS unit (see EPS Unit Removal/Installation).

EPS (Electric Power Steering) System

★If the reading is not infinity (∞) Ω, disconnect the EPS ECU connectors and check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

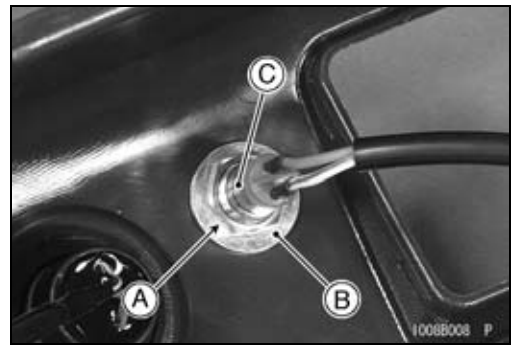
Wiring Continuity Inspection
EPS ECU Connector [A] ⟷
EPS Motor Connector [B]
R Lead Terminal [C]
BK Lead Terminal [D]



★If the wiring is good, check the power supply voltage (see EPS ECU Power Supply Voltage Inspection).
★If the power supply voltage is good, but the problem still exists, replace the EPS ECU (see EPS ECU Removal/Installation).

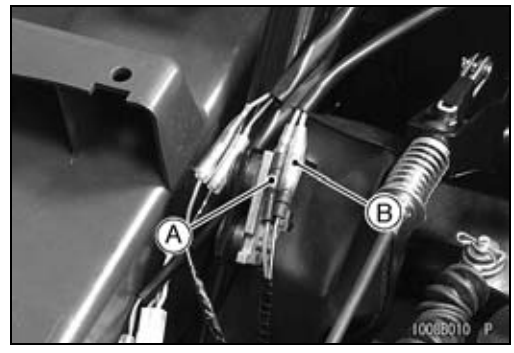
EPS Warning Indicator Light (LED) Removal

● Remove:
Control Panel (see Control Panel Removal in the Frame chapter)
Nut [A]
Washer [B]
EPS Warning Indicator Light (LED) [C]



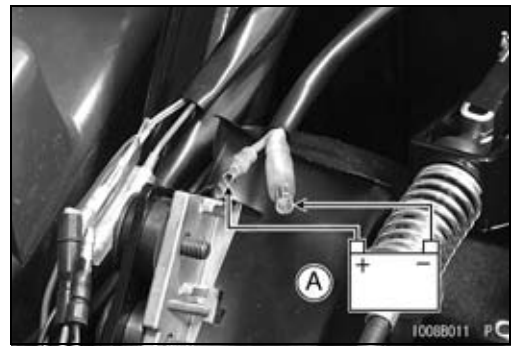
EPS Warning Indicator Light (LED) Inspection

● Remove the front cargo compartment (see Front Cargo Compartment Removal in the Frame chapter).
● Disconnect the EPS warning indicator light (LED) lead connectors.
R Lead [A]
BK/W Lead [B]



● Using two auxiliary leads, connect the 12 V battery [A] to the EPS warning indicator light (LED) lead connectors as follows.

EPS Warning Indicator Light (LED) Inspection
Connections:
Battery (+) Terminal → R Lead
Battery (–) Terminal → BK/W Lead

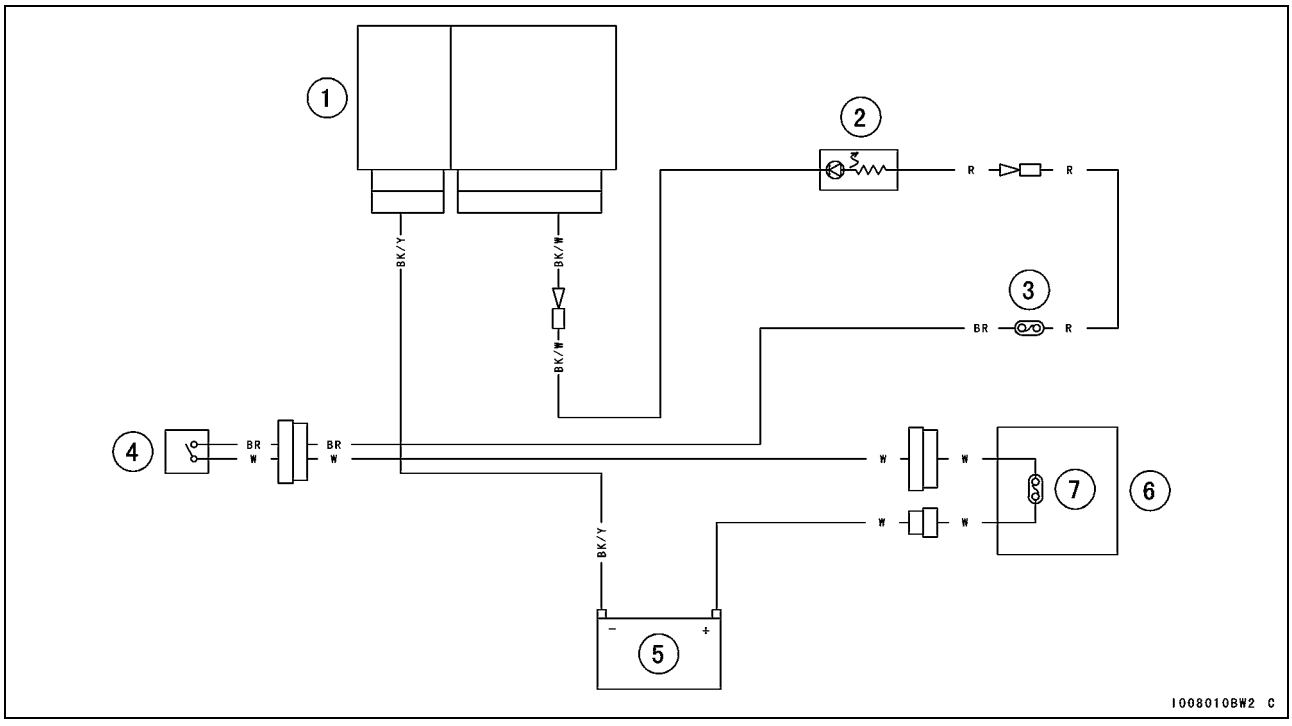


EPS (Electric Power Steering) System

★If the EPS warning indicator light (LED) [A] does not light up, replace it (see EPS Warning Indicator Light (LED) Removal).
★If the EPS warning indicator light (LED) lights up, check the wiring for continuity (Refer to the next wiring diagram).



EPS Warning Indicator Light (LED) Circuit

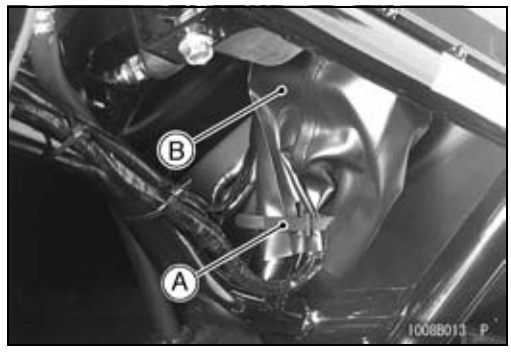


1. EPS ECU
2. EPS Warning Indicator Light (LED)
3. 7.5 A EPS Fuse
4. Main Switch
5. Battery 12 V 52 Ah
6. Fuse Box
7. 30 A Fuse

EPS ECU Removal

CAUTION
Never drop the EPS ECU, especially on a hard surface. Such a shock to the EPS ECU can damage it.

● Remove the band [A] and open the ECU cover [B].

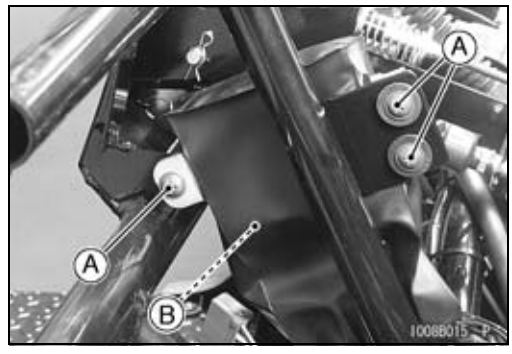


EPS (Electric Power Steering) System

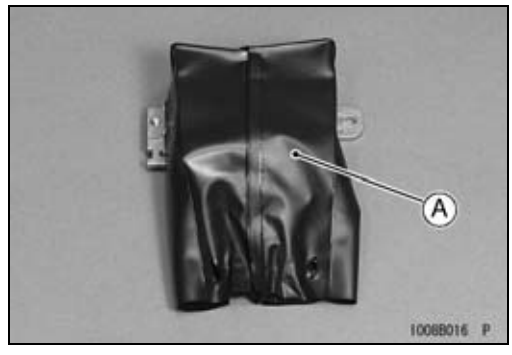
● Disconnect the EPS ECU connectors [A].



● Remove:
Right Glove Compartment (see Glove Compartment Removal in the Frame chapter)
Screws [A]
EPS ECU [B] (with Cover)

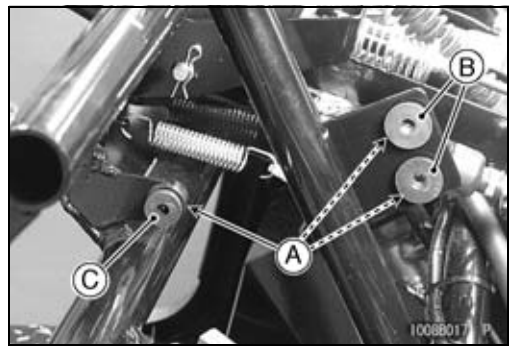


● Remove the cover [A] from the EPS ECU.

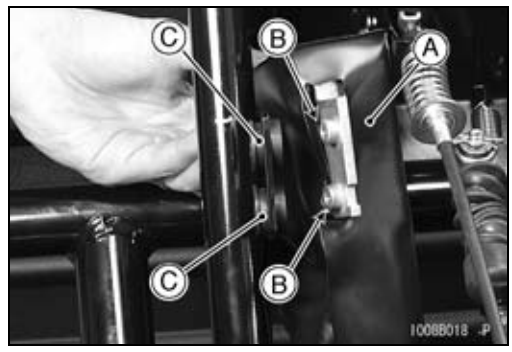


EPS ECU Installation

● Check that the rubber dampers [A], collars [B] and wellnut [C] are in place on the frame.
★If the rubber dampers are damaged or deteriorated, replace them.
○When installing the rubber dampers, note the following.
○Install the two rubber dampers of the front side so that the thin thickness side faces right side.
○Do not apply a soap and water solution or rubber lubricant.



● Install the cover [A] on the EPS ECU.
○Install the cover so that open side faces left side.
● Insert the projections [B] of the EPS ECU to the rubber dampers [C].
● Tighten the screws securely.



EPS (Electric Power Steering) System

● When installing the band to the cover, note the following.
○Pass the band through four slits [A] of the cover.
○Bind the cover with the band securely.
★If the EPS ECU was replaced, be sure to register the EPS neutral position(see EPS Neutral Position Registration).



NOTE

○*The EPS system can not function until the neutral position is registered in the new EPS ECU.*

EPS ECU Power Supply Voltage Inspection

● Remove the band and open the cover (see EPS ECU Removal).
● Visually inspect the EPS ECU connectors [A].
★If the connector is clogged with mud or dust, blow it off with compressed air.
★If the connectors are normal, check the terminals of the EPS ECU connectors.
● Turn the main switch OFF.
● Disconnect the EPS ECU connectors.
● Visually inspect the terminals of the EPS ECU connectors (main harness and EPS ECU).
★If the terminals of the main harness connectors are damaged, replace the main harness.
★If the terminals of the EPS ECU connectors are damaged, replace the EPS ECU.



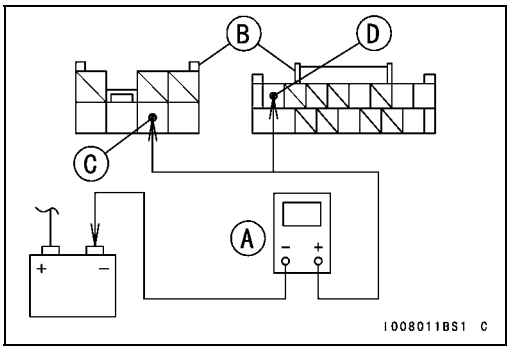
★If the terminals are normal, measure the power supply voltage of the EPS ECU.

NOTE

○*Be sure the battery is fully charged.*

● Set the hand tester [A] to the DC 25 V range and connect it to the main harness connectors [B].

Special Tool - Hand Tester: 57001-1394

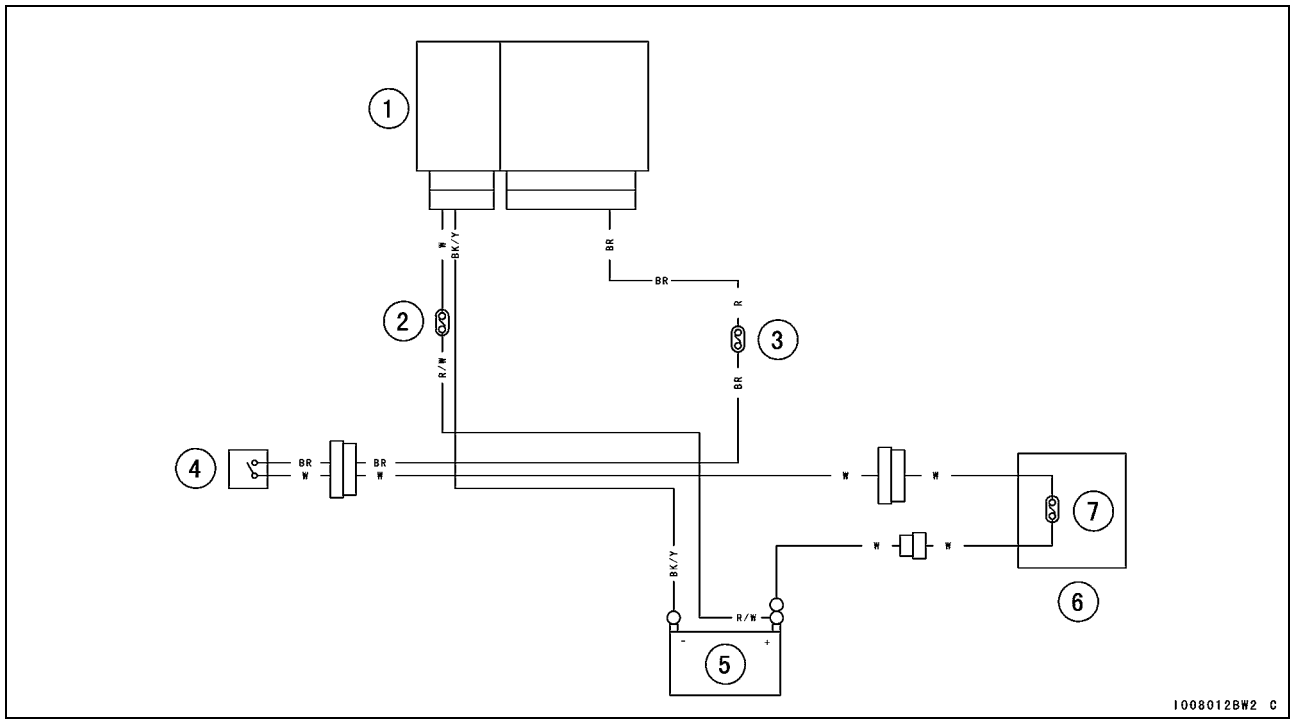


EPS ECU Power Supply Voltage Inspection
Connections:
(I) Hand Tester (+) → W Lead Terminal [C]
Hand Tester (–) → Battery (–) Terminal
(II) Hand Tester (+) → BR Lead Terminal [D]
Hand Tester (–) → Battery (–) Terminal
Main Switch OFF:
Connection (I): Battery Voltage
Connection (II): 0 V
Main Switch ON:
Both Connections: Battery Voltage

★If the reading is out of the specification, check the following.
40 A EPS Fuse (see Fuse Inspection)
7.5 A EPS Fuse (see Fuse Inspection)
Power Source Wiring and Ground Wiring (Refer to the next wiring diagram.)

EPS (Electric Power Steering) System

EPS ECU Power Source Circuit



1. EPS ECU
2. 40 A EPS Fuse
3. 7.5 A EPS Fuse
4. Main Switch
5. Battery 12 V 52 Ah
6. Fuse Box
7. 30 A Fuse

EPS Motor Removal

CAUTION
Do not remove the EPS motor [A] from the EPS unit since it has been adjusted and set with precision at the factory.



EPS Torque Sensor Removal

CAUTION
Do not remove the EPS torque sensor [A] from the EPS unit since it has been adjusted and set with precision at the factory.

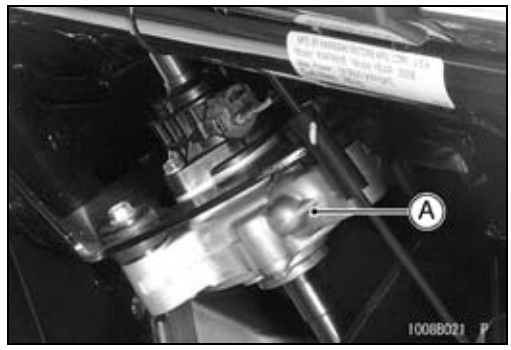


EPS (Electric Power Steering) System

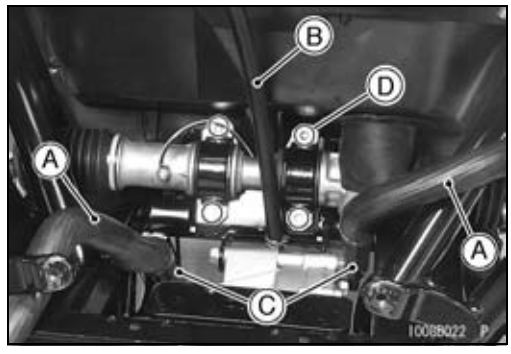
EPS Unit Removal

CAUTION

The EPS unit [A] has been adjusted and set with precision at the factory. Therefore, it should be handled carefully, never struck sharply, as with a hammer, or allowed to fall on a hard surface. Be careful not to get water or mud on the EPS unit.



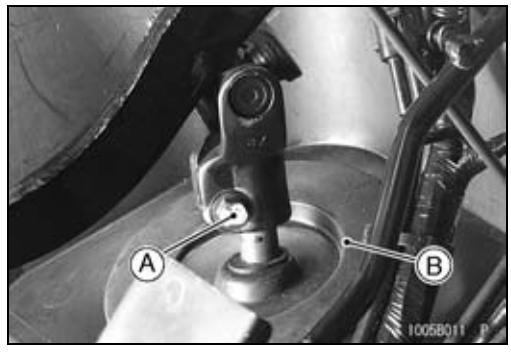
- Remove:
  Radiator (see Radiator Removal in the Cooling System chapter)
  Left Radiator Side Cover (see Radiator Side Cover Removal in the Frame chapter)
  Water Hoses [A]
  Vent Hose [B]
- Remove the mounting bolts of the water pipes [C], and lower them.
- Remove the steering gear assembly bracket bolts [D] and brackets.



- Remove the universal joint clamp bolt [A].

★If the clamp bolt becomes hard to turn, search the position that it can be easily turned while turning the steering wheel slowly.

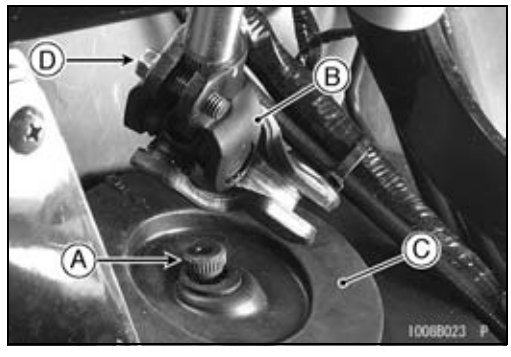
- Pull out the rubber boot [B] upward temporary.



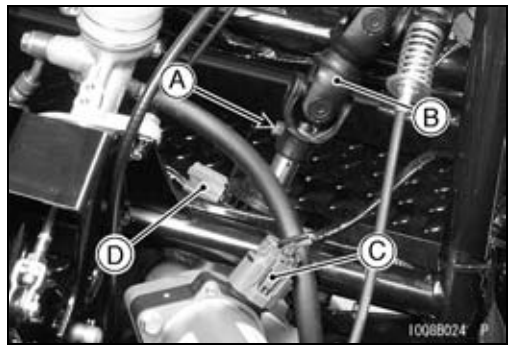
- Move the steering gear assembly, and pull off the shaft [A] from the lower universal joint [B].

○Lower the steering gear assembly, and then pull it forward.

- Remove:
  Rubber Boot [C]
  Universal Joint Clamp Bolt [D]
  Lower Universal Joint

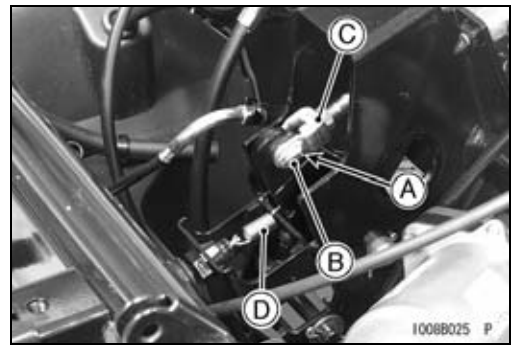


- Remove:
  Steering Shaft (see Steering Wheel and Steering Shaft Removal)
  Universal Joint Clamp Bolt [A]
  Upper Universal Joint [B]
- Disconnect:
  EPS Motor Connector [C]
  Torque Sensor Connector [D]



EPS (Electric Power Steering) System

- Remove:
  Cotter Pin [A]
  Pin [B]
  Push Rod [C]
  Spring [D]

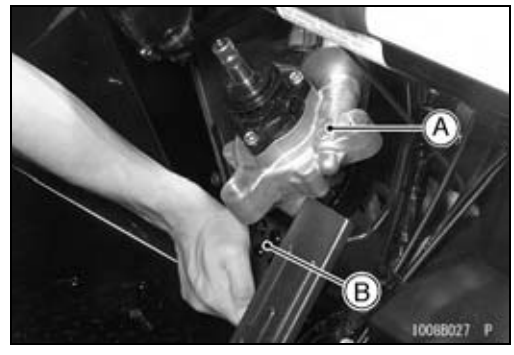


- Remove the EPS unit mounting bolts [A].



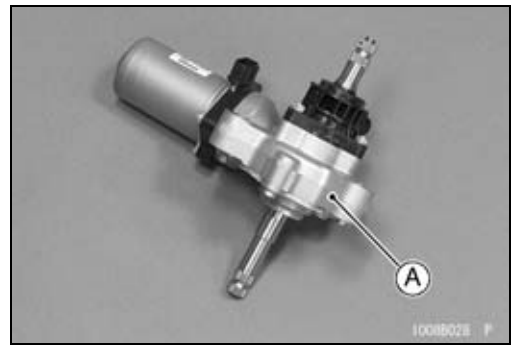
- Remove the EPS unit [A] downward while pushing down the brake pedal [B].

○Insert the lower shaft to the hole of the under cover and avoid the upper shaft from the frame.



CAUTION

The EPS unit [A] has been adjusted and set with precision at the factory. Do not try to disassemble and repair the EPS unit.



EPS Unit Installation

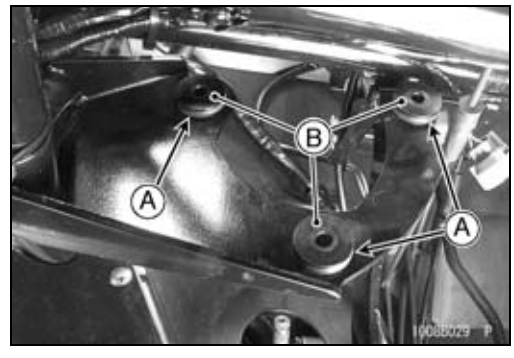
- Check that the rubber dampers [A] and upper and lower collars [B] are in place on the frame.

★If the rubber dampers are damaged or deteriorated, replace them.

○When installing the rubber dampers, note the following.

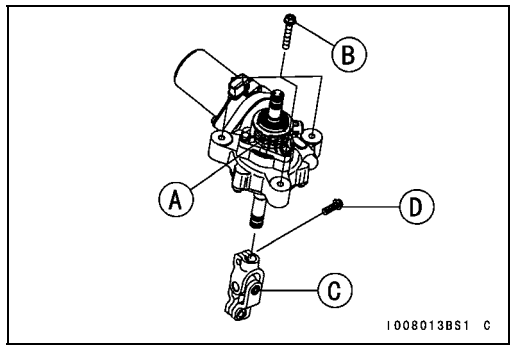
○Install the rubber dampers so that the thin thickness side faces up.

○Do not apply a rubber lubricant.



EPS (Electric Power Steering) System

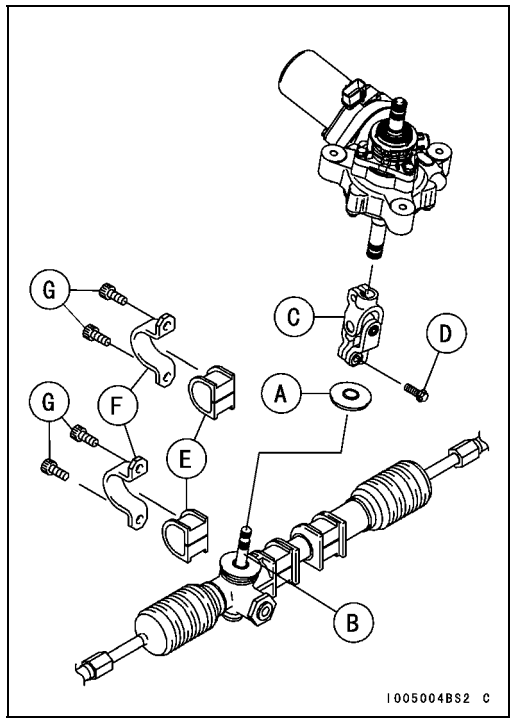
- Install the EPS unit so that the EPS torque sensor [A] faces upside.
- Install the EPS unit mounting bolts [B] and tighten them temporary.
- Install the lower universal joint [C] to the shaft of the EPS unit.
- Install the universal joint clamp bolt [D] while aligning the notch on the shaft of the EPS unit with the clamp bolt hole on the lower universal joint, and tighten it temporary.



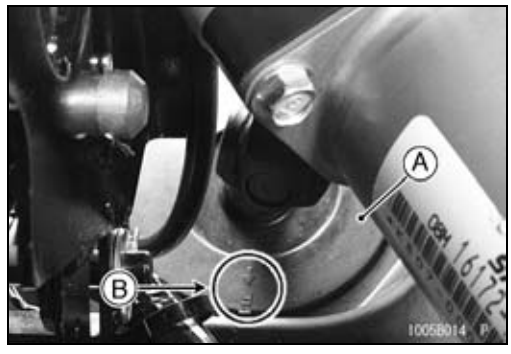
- Install the rubber boot [A] on the shaft [B] of the steering gear assembly temporary.
- Install the shaft of the steering gear assembly to the lower universal joint [C].
- Install the universal joint clamp bolt [D] while aligning the notch on the shaft of the steering gear assembly with the clamp bolt hole on the lower universal joint, and tighten it temporary.
- Install:
  Rubber dampers [E]
  Brackets [F]
- Apply non-permanent locking agent to the steering gear assembly bracket bolts [G] and tighten them evenly.

  Torque - Steering Gear Assembly Bracket Bolts: 52 N·m (35.3 kgf·m, 238 ft·lb)
- Tighten the EPS unit mounting bolts to the specified torque.

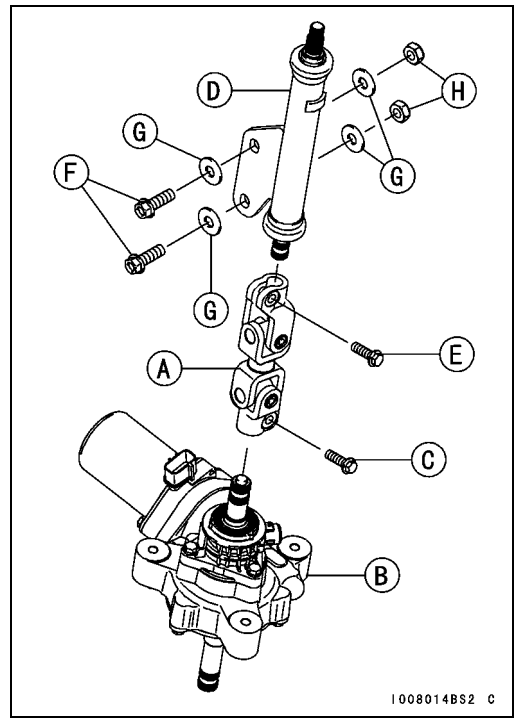
  Torque - EPS Unit Mounting Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)



- Install the rubber boot [A] so that the mark (F, Arrow) [B] faces forward.



EPS (Electric Power Steering) System



- Install the upper universal joint [A] to the shaft of the EPS unit [B].
- Install the universal joint clamp bolt (lower) [C] while aligning the notch on the shaft of the EPS unit with the clamp bolt hole on the upper universal joint, and tighten it temporary.
- Install the steering shaft [D] to the upper universal joint.
- Install the universal joint clamp bolt (upper) [E] while aligning the notch on the steering shaft with the clamp bolt hole on the upper universal joint, and tighten it temporary.
- Install the steering shaft mounting bolts [F], washers [G] and nuts [H].
- Tighten all the universal joint clamp bolts to the specified torque.

Torque - Universal Joint Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)

- Mount the steering wheel on the steering shaft temporarily.
- Adjust the following items.
  Steering Wheel Position (see Steering Wheel Position Adjustment)
  Steering Wheel Centering (see Steering Wheel Centering)
- Install the removed parts (see appropriate chapters).
- Be sure to register the EPS neutral position (see EPS Neutral Position Registration).

Speed Sensor Removal/Installation

- Refer to the Speed Sensor Removal/Installation in the Electrical System chapter.

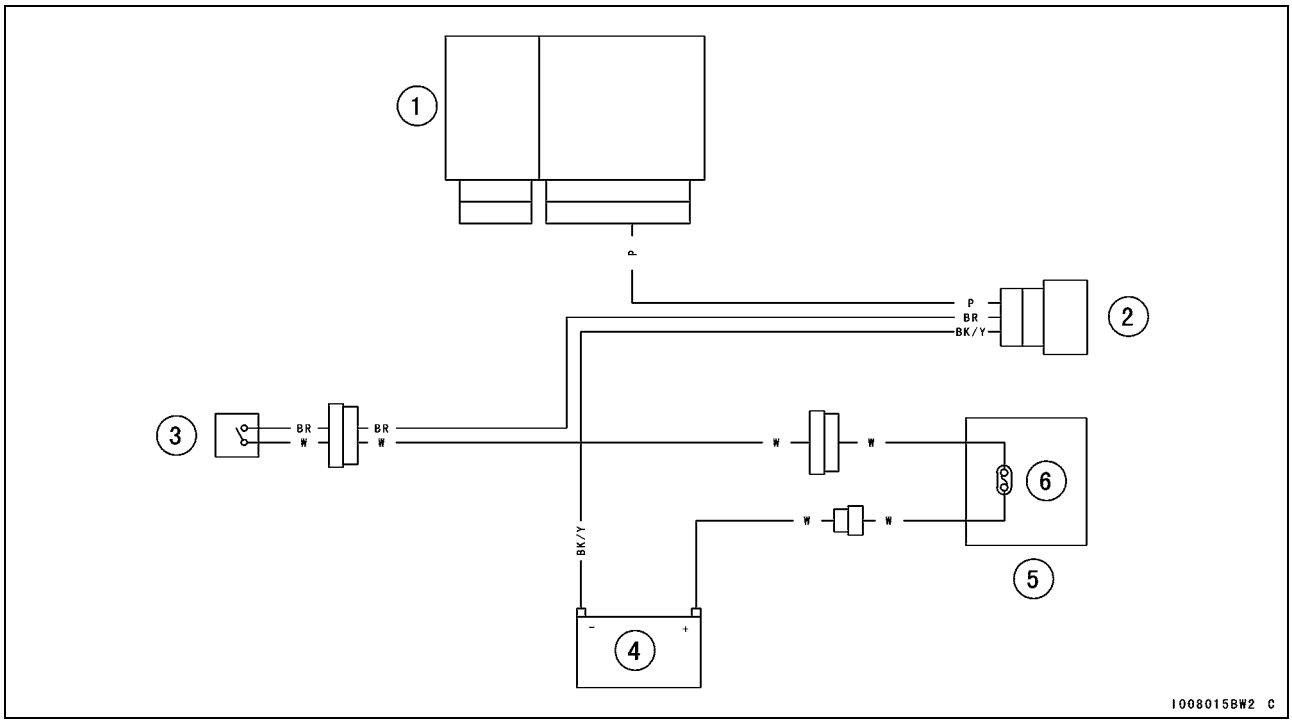
Speed Sensor Inspection

- Refer to the Speed Sensor Inspection in the Electrical System chapter.

★If the speed sensor is normal, check the wiring for continuity (Refer to the next wiring diagram.).

EPS (Electric Power Steering) System

Speed Sensor Circuit



1. EPS ECU
2. Speed Sensor
3. Main Switch
4. Battery 12 V 52 Ah
5. Fuse Box
6. 30 A Fuse

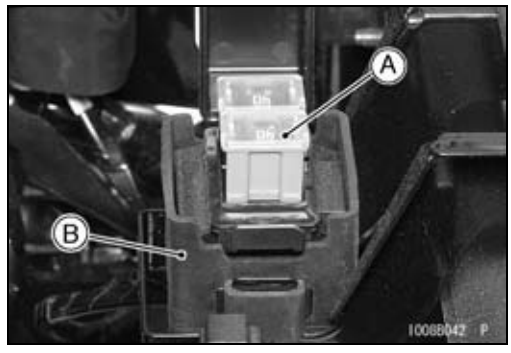
40 A EPS Fuse Removal

CAUTION

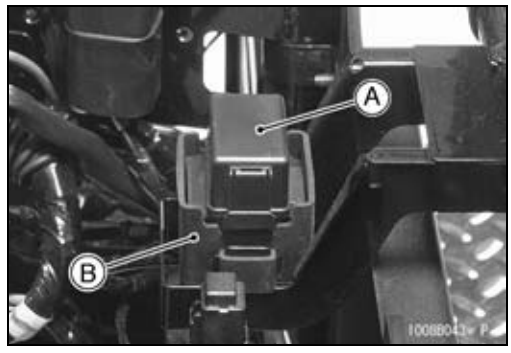
Before removing the 40 A fuse [A], be sure to disconnect the battery cables to avoid electrical shock.

NOTE

○*The 40 A EPS fuse is installing with bolts to the EPS fuse box 1 [B].*

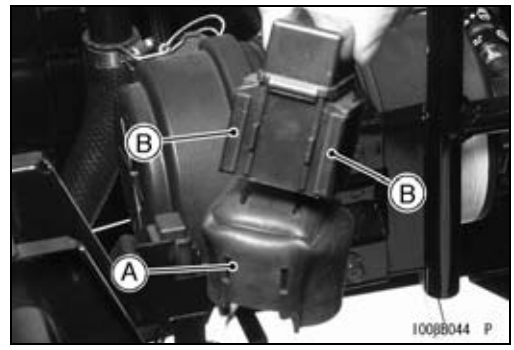


- Disconnect the battery cables (see Battery Removal in the Electrical System chapter).
- Tilt up the seat.
- Lift up the EPS fuse box 1 [A] with rubber protector [B].

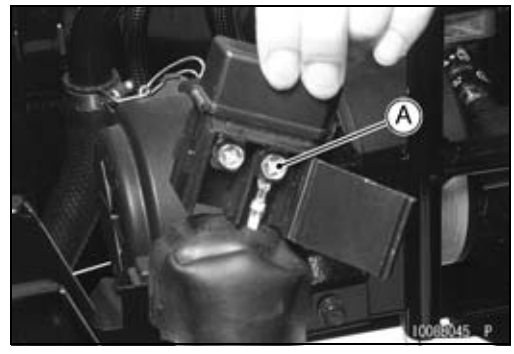


EPS (Electric Power Steering) System

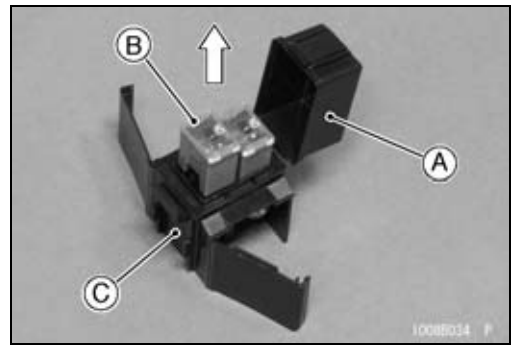
- Slide the rubber protector [A].
- Unlock the hooks to open the lids [B].



- Remove the terminal bolt [A] on both sides.

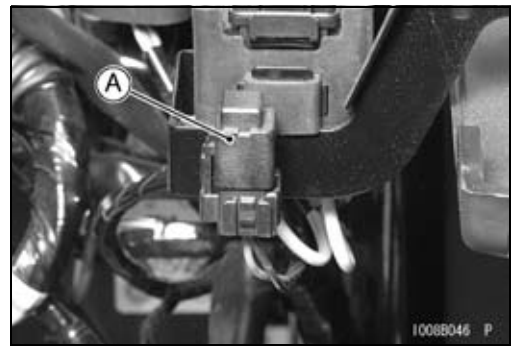


- Unlock the hook to lift up the lid [A].
- Pull the 40 A EPS fuse [B] straight out of the EPS fuse box 1 [C].

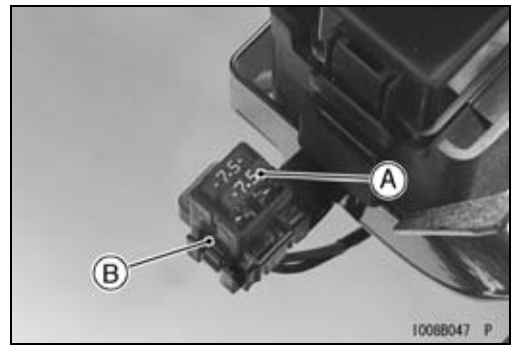


7.5 A EPS Fuse Removal

- Tilt up the seat.
- Unlock the hook to lift up the lid [A].



- Pull the 7.5 A EPS fuse [A] straight out of the EPS fuse box 2 [B].



EPS (Electric Power Steering) System

Fuse Installation

★If a fuse fails during operation, inspect the EPS system to determine the cause, and then replace it with a new fuse of proper amperage.

○For 40 A EPS fuse, after installing the lead terminals, tighten the terminal bolts securely.

Fuse Inspection

● Remove the fuse (see 7.5 A EPS Fuse Removal/40 A EPS Fuse Removal).

● Refer to the Fuse Inspection in the Electrical System chapter.

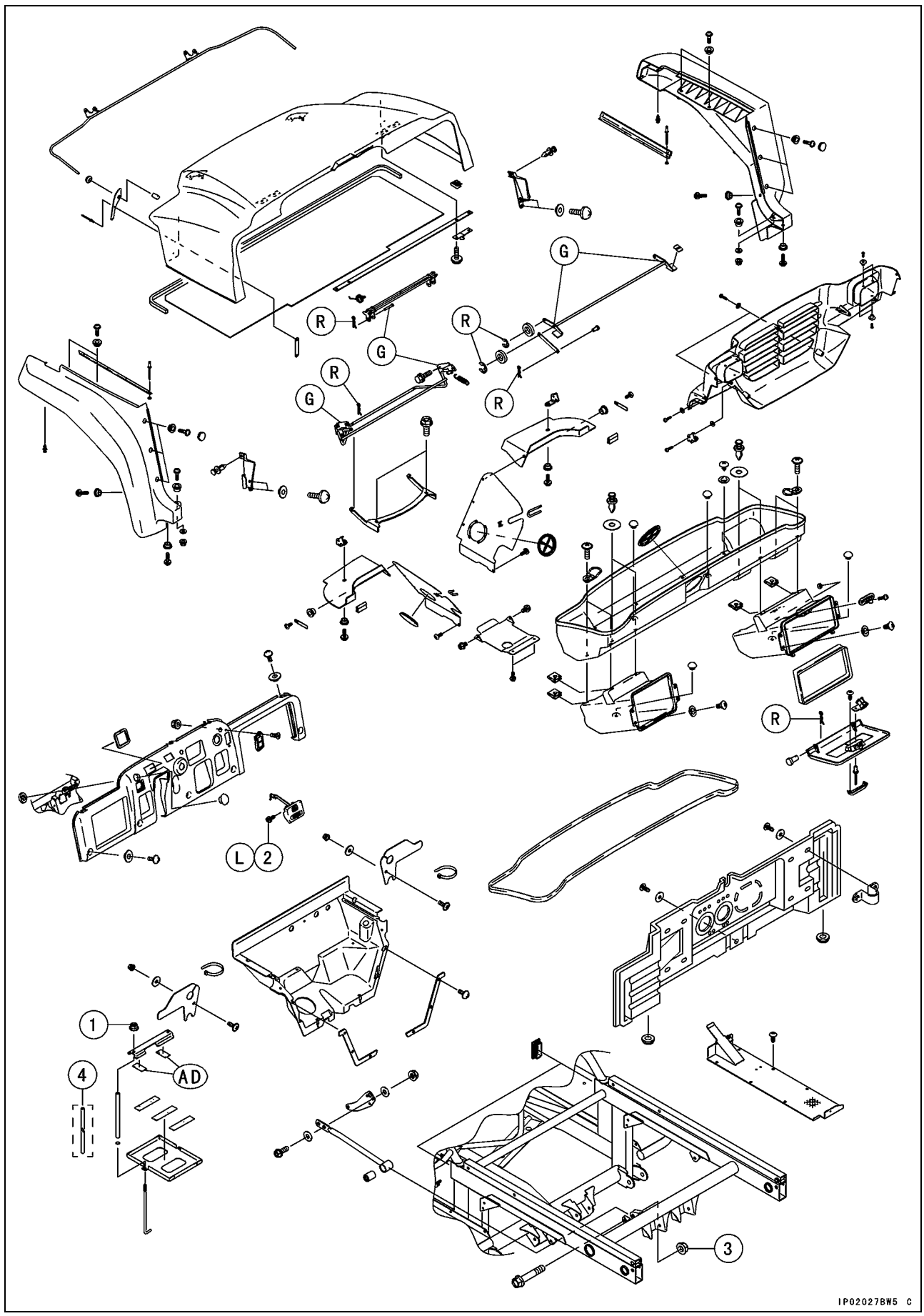
○For 40 A EPS fuse, there is window for inspection in the upper surface.

Frame

Table of Contents

Exploded View 16-2
Seat and Seat Belts 16-8
Seat Removal 16-8
Seat Installation 16-8
Seat Belt Removal 16-8
Seat Belt Installation 16-9
Control Panel 16-10
Control Panel Removal 16-10
Glove Compartment Removal 16-11
Front Cargo Compartment 16-12
Front Cargo Hood Removal 16-12
Front Cargo Compartment Removal 16-12
Cargo Bed 16-13
Cargo Bed Removal 16-13
Cargo Bed Installation 16-13
Front, Center and Rear Bars 16-15
Front Bar Removal 16-15
Front Bar Installation 16-15
Rear Bar Removal 16-15
Rear Bar Installation 16-16
Cargo Bed Latch Position Inspection 16-16
Cargo Bed Latch Position Adjustment 16-16
Front Fender Assembly 16-17
Front Fender Removal 16-17
Front Guard Removal 16-17
Front Cover Removal 16-17
Radiator Side Cover Removal 16-18
Radiator Side Cover Installation 16-19
Radiator Side Cover Flap Removal 16-19
Floor Center Panel Removal 16-19
Rear End Subframe 16-20
Rear End Subframe Removal 16-20
Rear End Subframe Installation 16-20

Exploded View

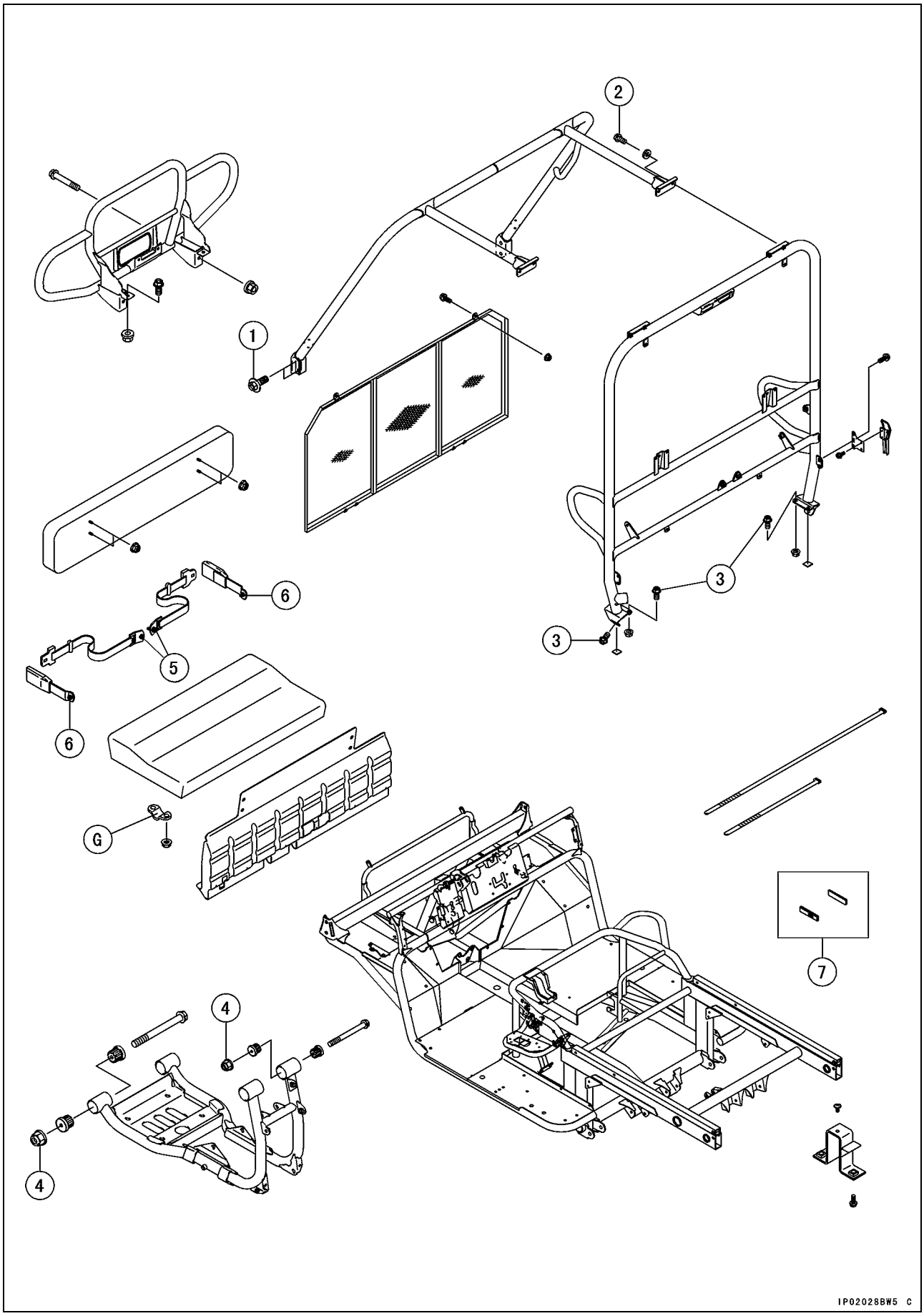


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Battery Holder Mounting Nuts	17	1.7	13	
2	Hood Latch Lever Mounting Bolts	37	3.8	27	L
3	Stay Rod Rear Nut	88	9.0	65	

4. EUR Model
AD: Apply adhesive.
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts

Exploded View

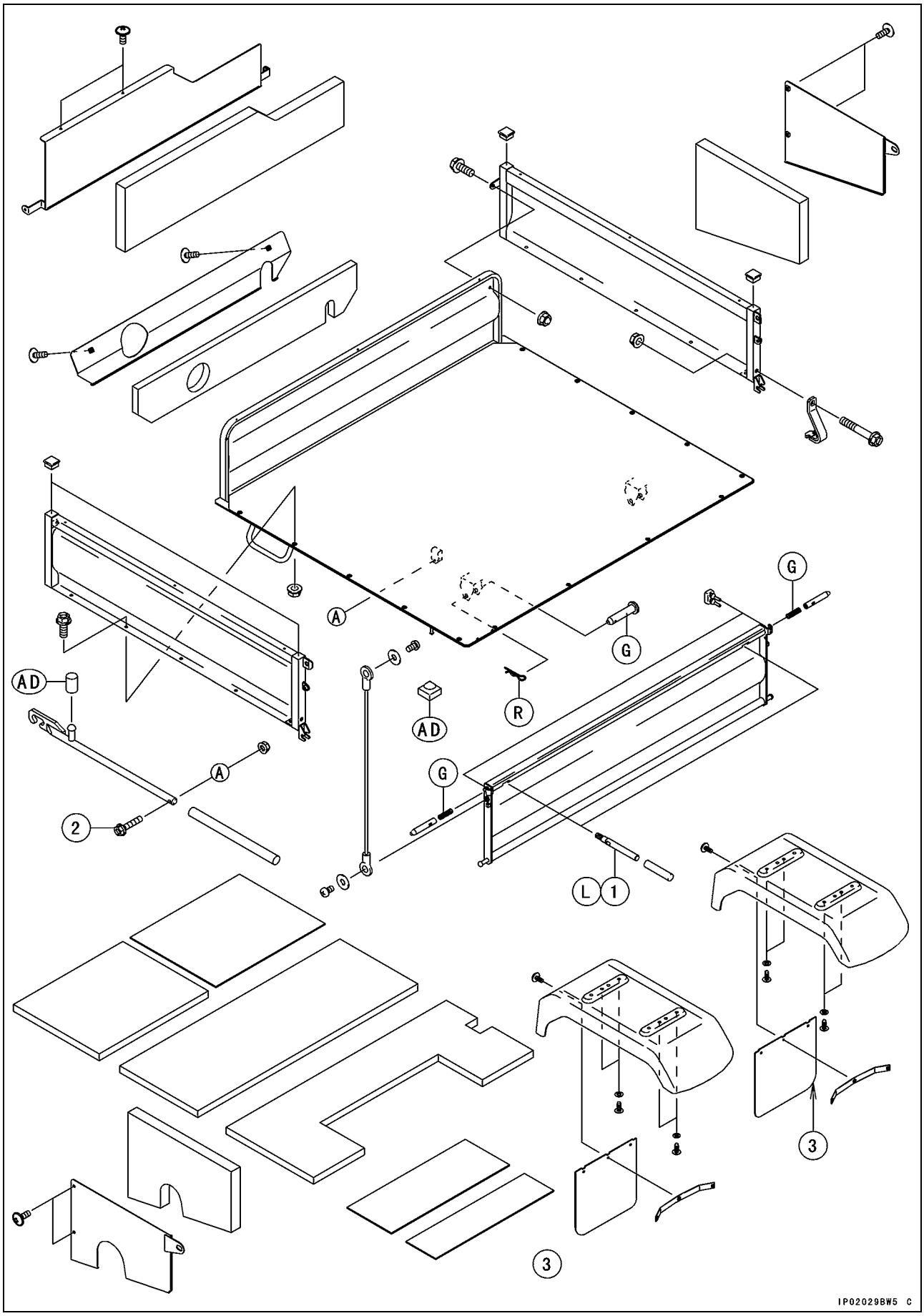


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Bar Mounting Bolts (Lower)	98	10.0	72.3	
2	Front Bar Mounting Bolts (Upper)	44	4.5	32	
3	Rear Bar Mounting Bolts	44	4.5	32	
4	Rear End Subframe Mounting Nuts	44	4.5	32	
5	Seat Belt Mounting Bolts	34	3.5	25	
6	Seat Belt Buckle Mounting Bolts	34	3.5	25	

7. Reflector (CA Model)
G: Apply grease.

Exploded View



Exploded View

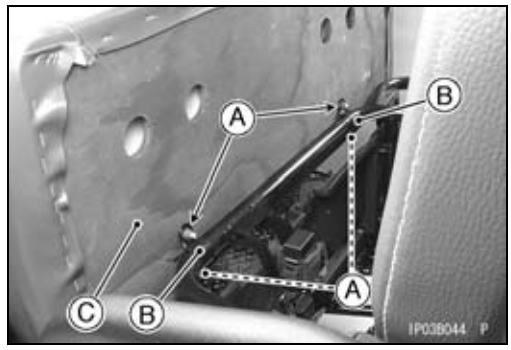
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Tail Gate Fixing Lever Screws	4.4	0.45	39 in·lb	L

2. Fix the bolt to inside from outside.
3. Large Corner Side
AD: Apply adhesive.
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts

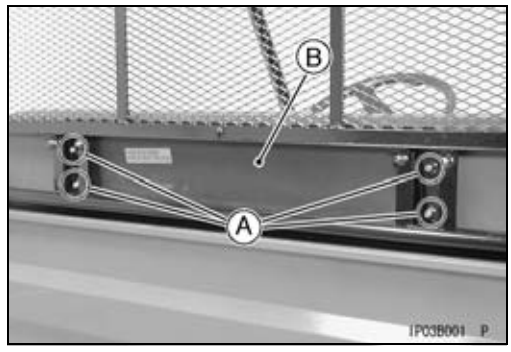
Seat and Seat Belts

Seat Removal

- Remove:
  Seat Bracket Nuts [A]
  Seat Brackets [B]
  Seat [C]

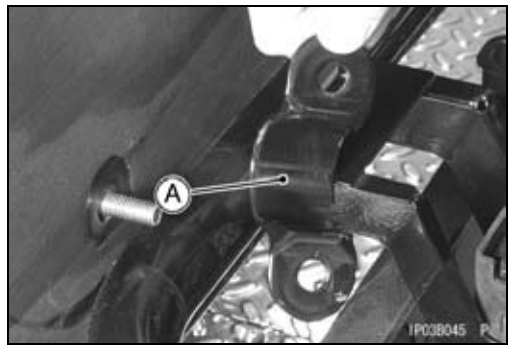


- Remove:
  Seat Back Mounting Nuts [A]
  Seat Back [B]



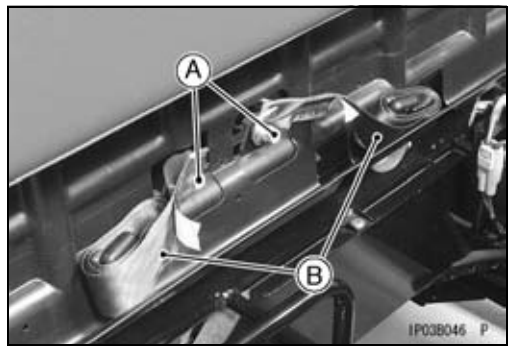
Seat Installation

- Apply grease to the inner surface of the seat bracket [A].
- Be careful not to overtighten the seat bracket nuts. After tightening the nuts, the seat must be moved up and down smoothly.

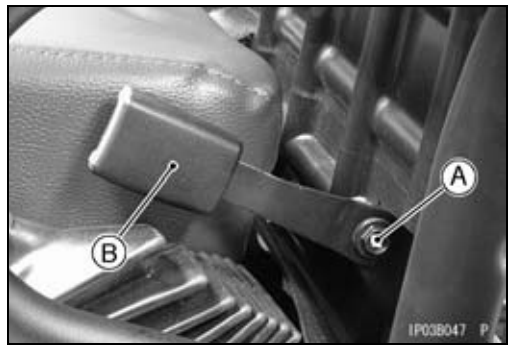


Seat Belt Removal

- Remove:
  Seat Belt Mounting Bolts [A]
  Seat Belts [B]



- Remove (Both Sides):
  Seat Belt Buckle Mounting Bolt [A]
  Seat Belt Buckle [B]



Seat and Seat Belts

Seat Belt Installation

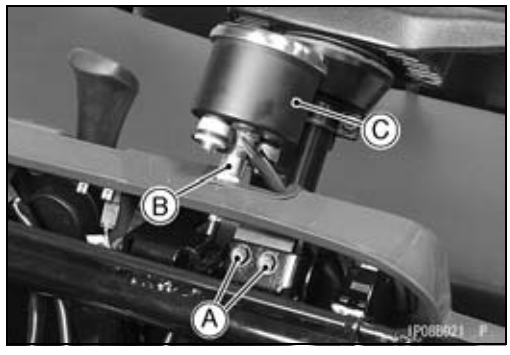
- Tighten:

Torque - Seat Belt Mounting Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)
Seat Belt Buckle Mounting Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)

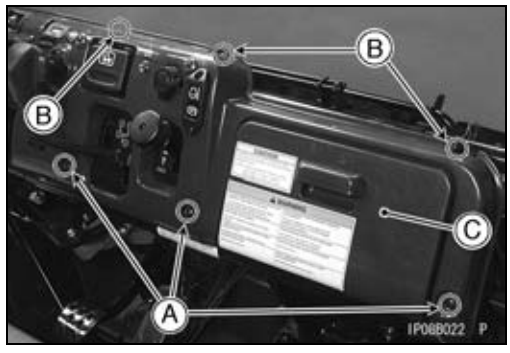
Control Panel

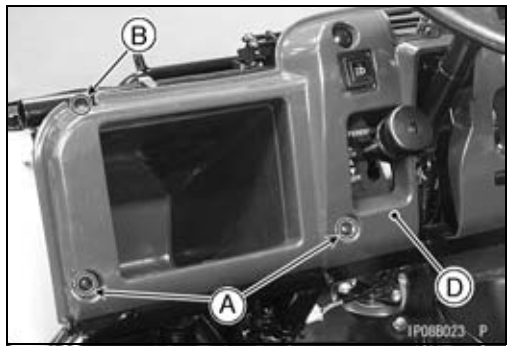
Control Panel Removal

- Remove the front cargo compartment (see Front Cargo Compartment Removal).
- Disconnect:
  Light Switch Lead Connector
  Hour Meter Lead Connector
  Main Switch Lead Connector
  Power Outlet Connector Lead Connector
  Coolant Temperature Warning/Parking Brake Indicator Light Lead Connector
  Speedometer Illumination Light Lead Connector
  EPS Warning Indicator Light (LED) Lead Connector
- Remove:
  Bolts [A]
  Speedometer Cable Upper End [B]
  Speedometer [C] with Bracket



- Remove control panel lower screws [A] and collars.
- Loosen control panel upper screws [B].
- Open the right glove compartment cover [C]
- Remove control panel [D].





Control Panel

Glove Compartment Removal

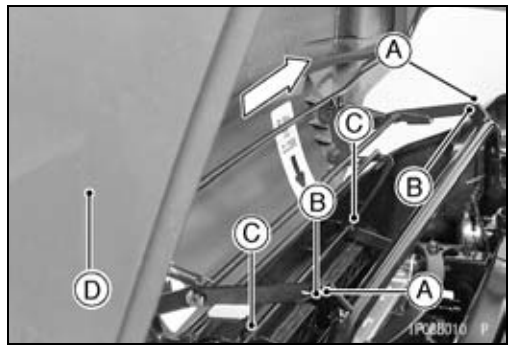
- Remove:
  Control Panel (see Control Panel Removal)
  Screws [A]
  Left Glove Compartment [B]
  Right Glove Compartment [C]



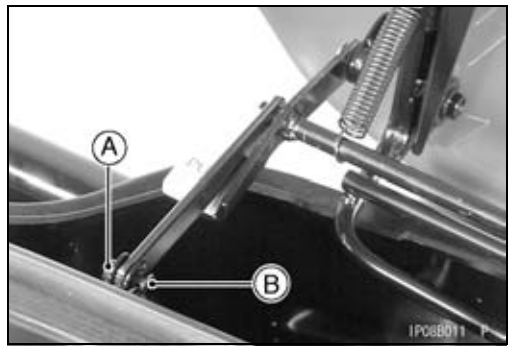


Front Cargo Compartment

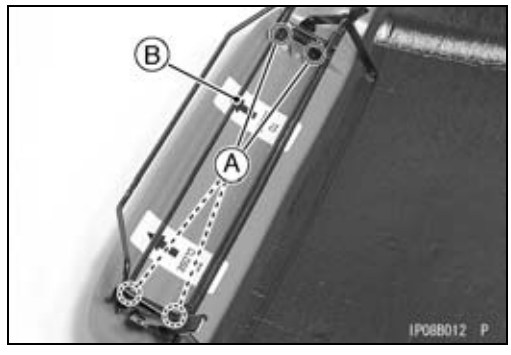
Front Cargo Hood Removal



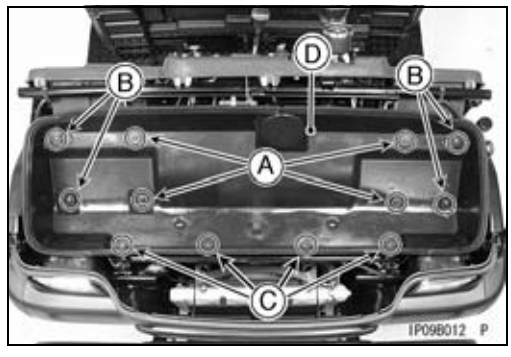
- Remove:
  Rear Snap Pins [A]
  Mounting Pins [B]
  Front Snap Pins [C]
- Slide the front cargo hood [D] to the right and remove it.



- Remove:
  Arm Assembly Bolts [A]
  Arm Assembly [B]
  Stay



Front Cargo Compartment Removal

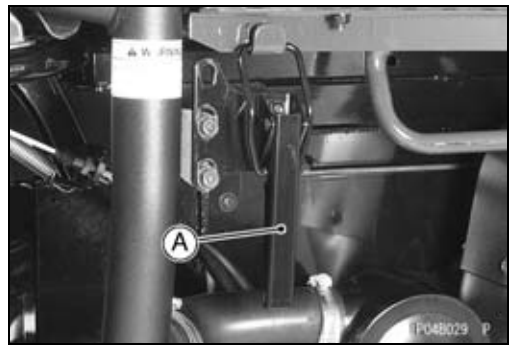


- Remove:
  Front Cargo Hood (see Front Cargo Hood Removal)
  Mounting Rivets [A]
  Screws and Hooks [B]
  Screws [C]
  Front Cargo Compartment [D]

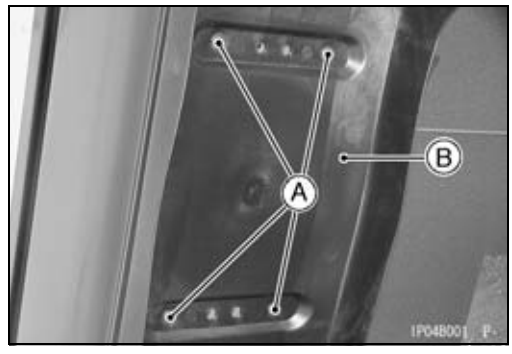
Cargo Bed

Cargo Bed Removal

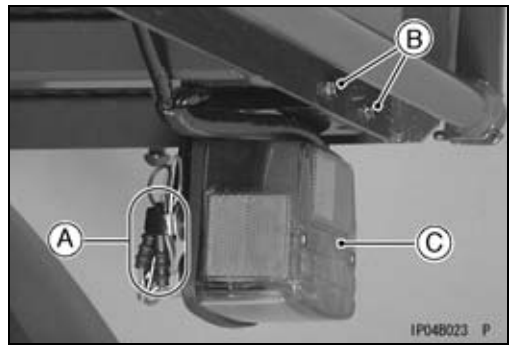
- Unlock the hooks [A].



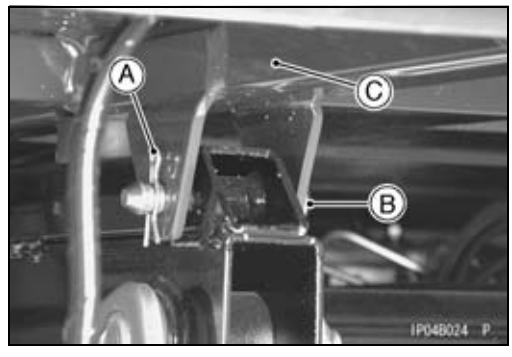
- Remove:
  Rear Fenders Mounting Screws [A] and Washers
  Rear Fenders [B]



- Remove:
  Tail/Brake Light Lead Connectors [A]
  Tail/Brake Light Mounting Bolts [B]
  Tail/Brake Light Assemblies [C]
- Free the harness from the cargo bed.

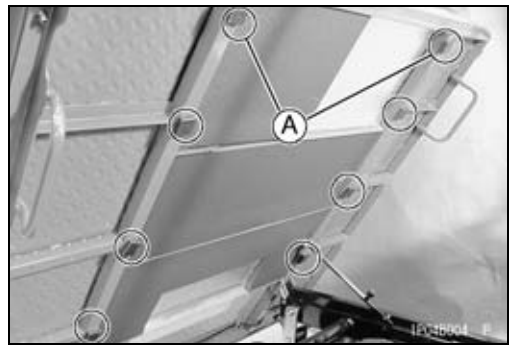


- Remove:
  Snap Pins [A]
  Cargo Bed Mounting Pins [B]
  Cargo Bed [C]



Cargo Bed Installation

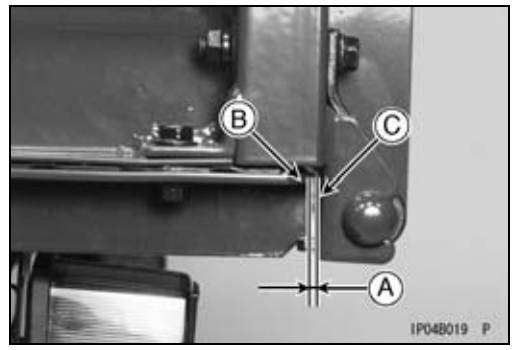
- Apply grease to the cargo bed mounting pins.
- Check that the following are in place on the cargo bed and frame.
  Cargo Bed Rubber Dampers [A]
  Tail Gate Pivot Rubber Dampers (Left and Right)



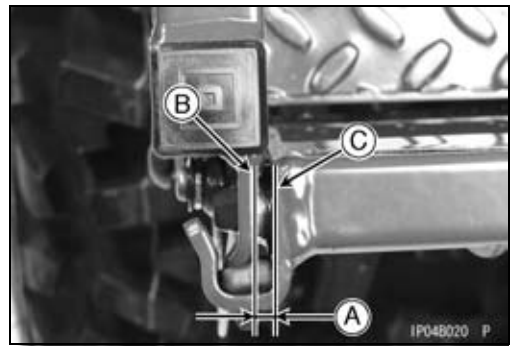
Cargo Bed

● When the cargo bed is disassembled, note the following when installing the plates and tail gate.

○Be sure the clearance [A] between the back end of the carrier [B] and the bottom of the tail gate [C] is more than 2 mm (0.079 in.) as shown in the figure (left and right).



○Be sure the clearance [A] between the plate end [B] and the tail gate end [C] is less than 5 mm (0.197 in.) as shown in the figure (left and right).



Front, Center and Rear Bars

Front Bar Removal



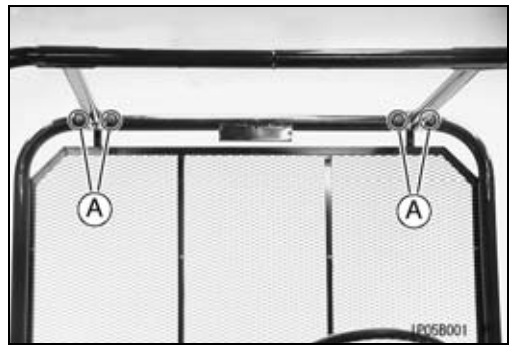
- Remove:
  Front Bar Mounting Bolts [A]
  Front Bar [B]

Front Bar Installation

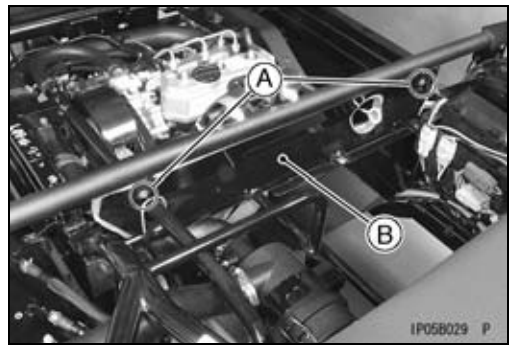
- Tighten:

Torque - Front Bar Mounting Bolts (Upper): 44 N·m (4.5 kgf·m, 32 ft·lb)
Front Bar Mounting Bolts (Lower): 98 N·m (10,0 kgf·m, 72,3 ft·lb)

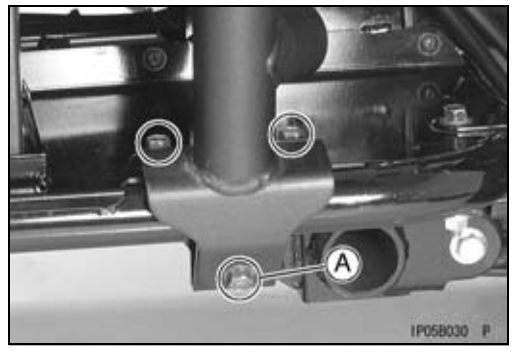
Rear Bar Removal



- Remove the rear bar mounting bolts [A].



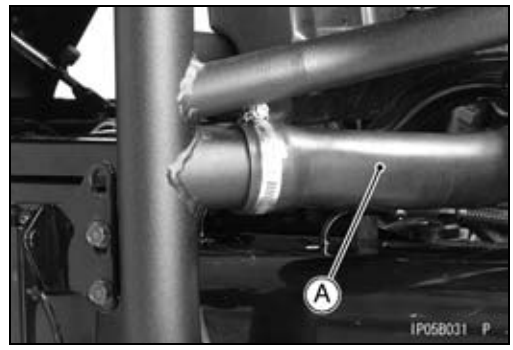
- Tilt up the cargo bed and seat.
- Remove:
  Seat Back (see Seat Removal)
  Screws [A]
  Damper Plate [B]



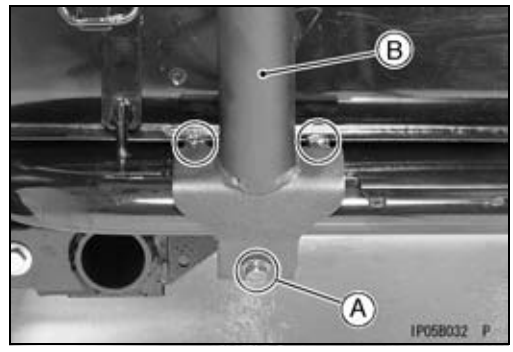
- Remove:
  Converter Air Cleaner Housing (see Air Cleaner Housing Removal in the Converter System chapter)
  Rear Bar Mounting Bolts and Nuts [A]

Front, Center and Rear Bars

● Remove the air duct [A].



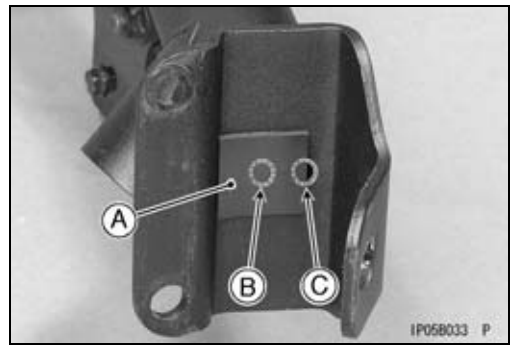
● Remove:
Rear Bar Mounting Bolts and Nuts [A]
Rear Bar [B]
○Slide back the rear bar and remove it from the vehicle.



Rear Bar Installation

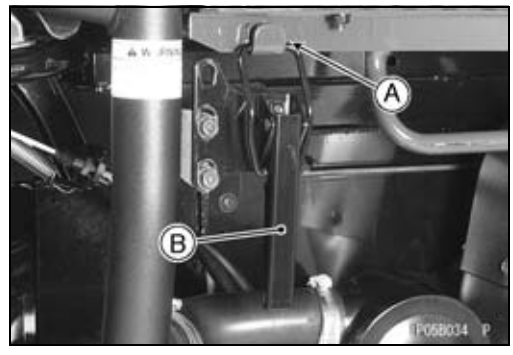
● Be sure the rubber plates [A] are in position.
○Plug one hole [B] and plug only half about another hole [C], using the rubber plate.
● Tighten:

Torque - Rear Bar Mounting Bolts: 44 N·m (4.5 kgf·m, 32 ft·lb)



Cargo Bed Latch Position Inspection

● Cargo bed must be latched securely on the cargo bed hooks [A] without rattling.
Latch [B]
★If there is rattling or not snug enough, adjust the latch positions.

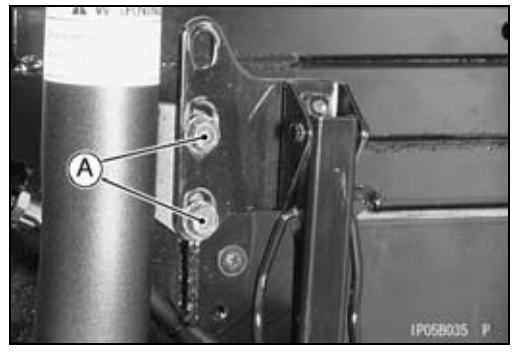


Cargo Bed Latch Position Adjustment

● Release the mounting bolts [A].
● Reposition the latch to the suitable place by sliding within the ellipse bolt holes.
● Retighten the mounting bolts.

NOTE

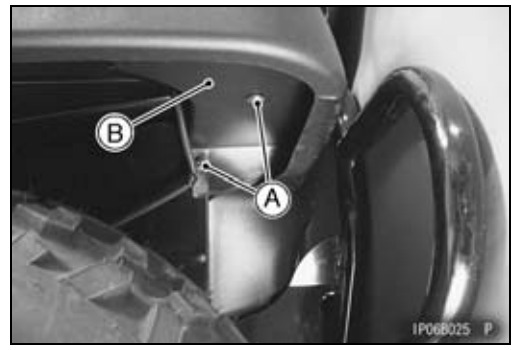
○*Adjustment must be made on both sides.*



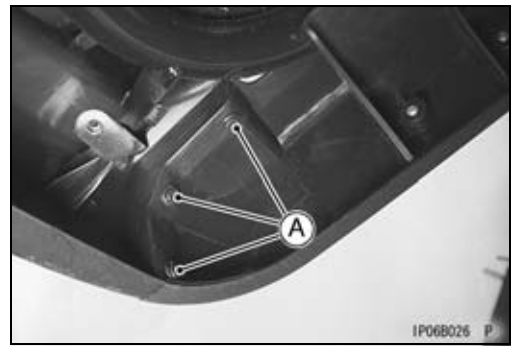
Front Fender Assembly

Front Fender Removal

- Remove:
  Tapping Screws [A] and Collars
  Guard [B]



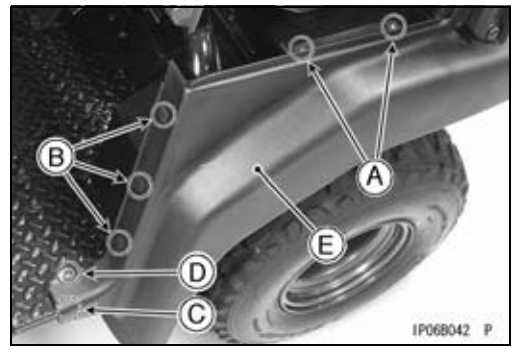
- Remove the rivets [A].



- Remove the screw [A] and collar.

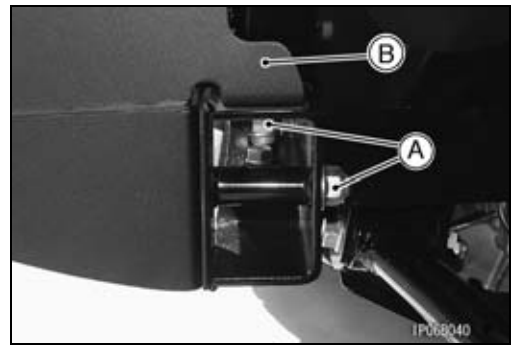


- Remove:
  Coolant Reserve Tank from Frame (Left Side only)
  Screws [A] and Collars
  Plugs [B], Tapping Screws and Collars
  Tapping Screw [C] and Collars
  Screw [D], Collar, Washer and Nut
  Front Fender [E]



Front Guard Removal

- Remove (Both Sides):
  Front Guard Bolts and Nuts [A]
  Front Guard [B]

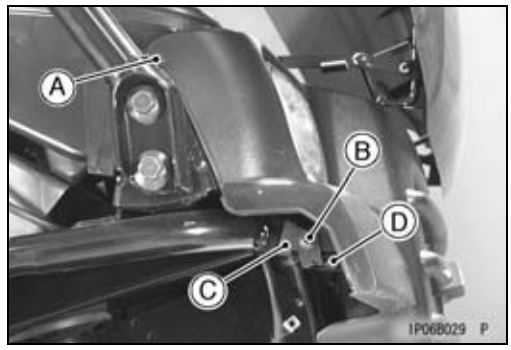


Front Cover Removal

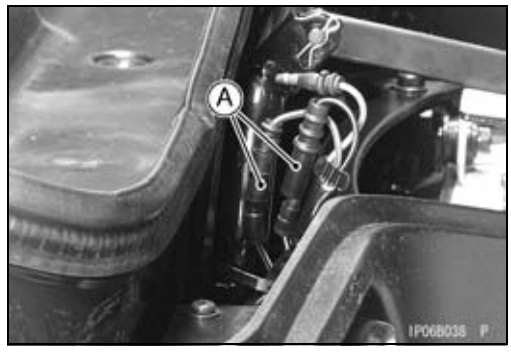
- Remove:
  Front Guard (see Front Cover Removal)
  Front Fenders (see Front Fender Removal)

Front Fender Assembly

- Remove:
  Rivets [A]
  Tapping Screws [B], Bracket [C] and Collars
  Tapping Screws [D] and Collars



- Disconnect the headlight lead connectors [A] on both sides.

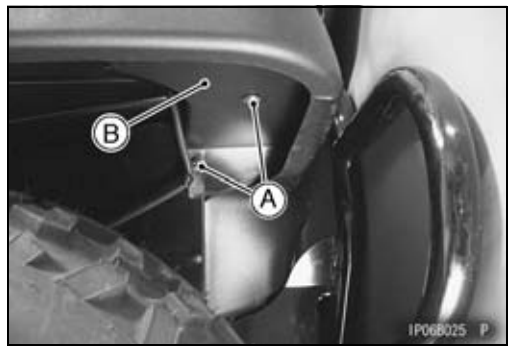


- Remove:
  Tapping Screws [A] and Collars
  Front Cover [B]

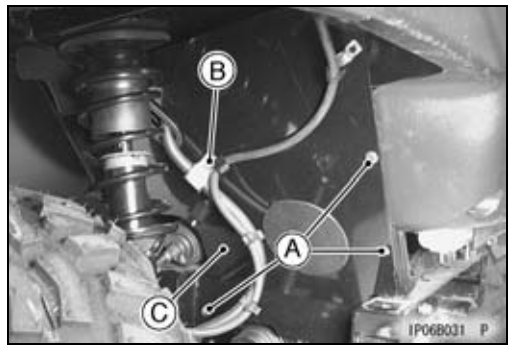


Radiator Side Cover Removal

- Remove:
  Front Guard (see Front Guard Removal)
  Tapping Screws [A] and Collars
  Guard [B]



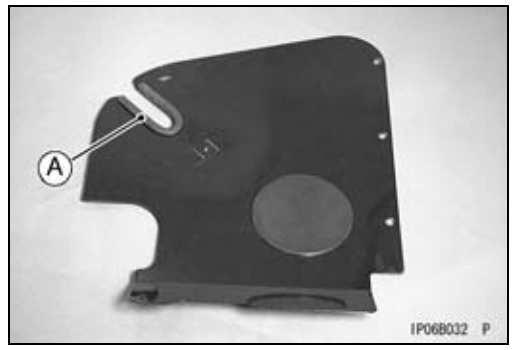
- Remove:
  Tapping Screws [A]
  Bolt [B]
  Radiator Side Cover [C]



Front Fender Assembly

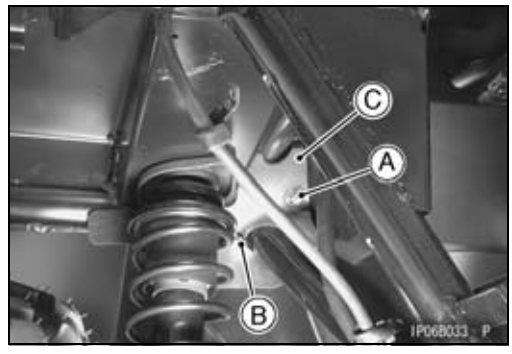
Radiator Side Cover Installation

- Check that the trim [A] is in place on the radiator side cover.



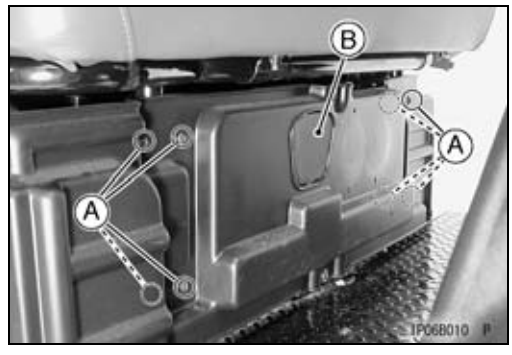
Radiator Side Cover Flap Removal

- Remove:
  Radiator Side Cover (see Radiator Side Cover Removal)
  Screw [A], Nut and Washer
  Clamp [B]
  Radiator Side Cover Flap [C]

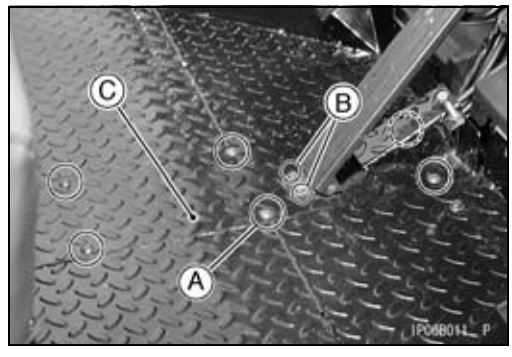


Floor Center Panel Removal

- Remove:
  Screws [A]
  Seat Lower Cover [B]



- Remove:
  Tapping Screws [A]
  Bolts [B]
  Floor Center Panel [C]



Rear End Subframe

Rear End Subframe Removal



- Remove:
  Engine (see Engine Removal in the Engine Removal/Installation)
  Transmission Case (see Transmission Case Removal in the Transmission chapter)
  Rear End Subframe Mounting Bolts [A] and Nuts
  Rear End Subframe [B]

Rear End Subframe Installation

- Tighten:

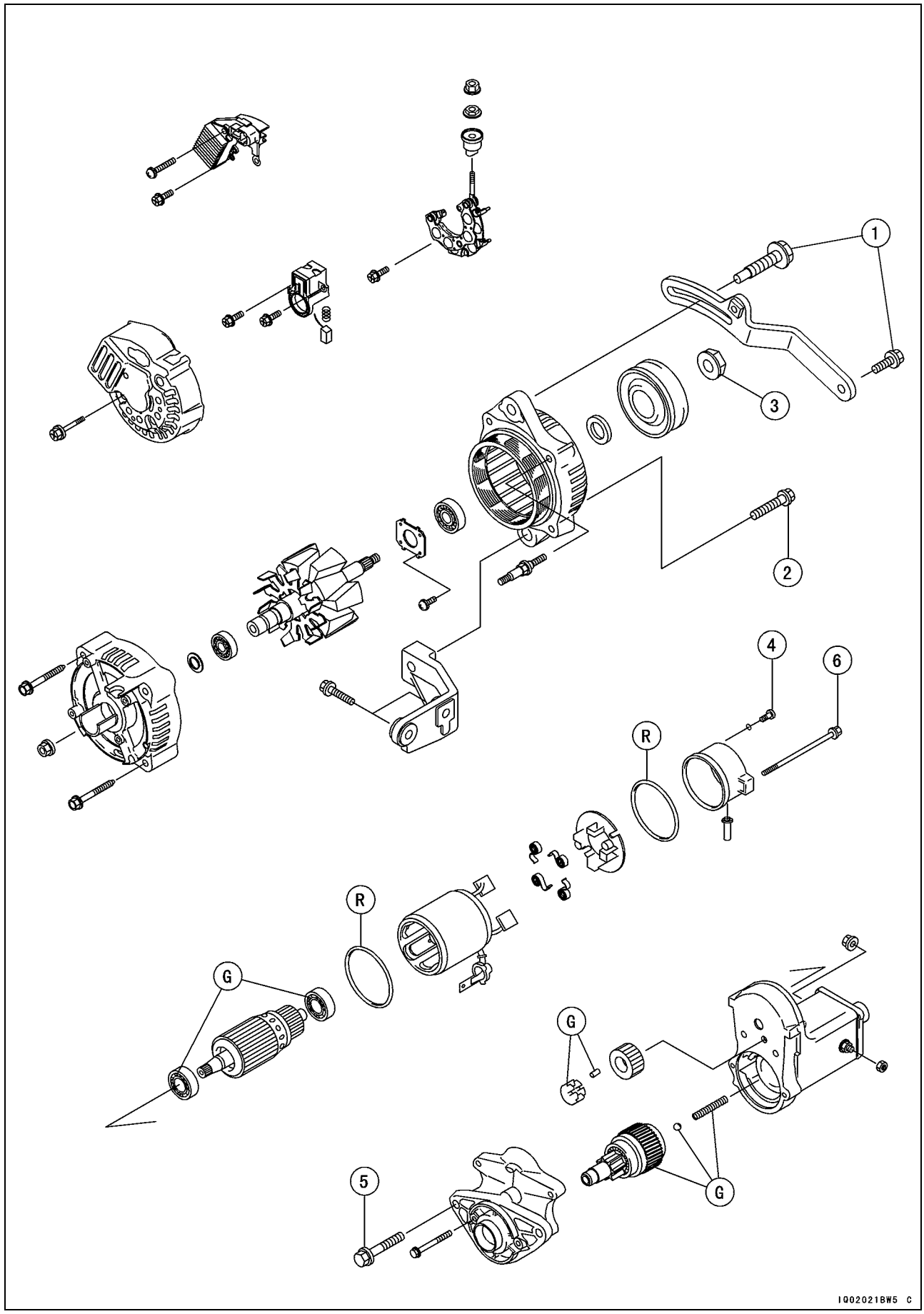
Torque - Rear End Subframe Mounting Nuts: 44 N·m (4.5 kgf·m, 33 ft·lb)

Electrical System

Table of Contents

Exploded View 17-2
Wiring Diagram 17-10
Specifications 17-12
Special Tools 17-13
Parts Location 17-14
Precautions 17-16
Electrical Wiring 17-17
  Wiring Inspection 17-17
Battery 17-18
  Battery Removal 17-18
  Battery Installation 17-18
  Electrolyte Level Inspection (Conventional Type Battery) 17-20
  Electrolyte Specific Gravity Inspection (Conventional Type Battery) 17-20
  Charging Condition Inspection (Conventional Type Battery) 17-20
  Initial Charging (Conventional Type Battery) 17-20
  Charging Condition Inspection (Sealed Type Battery) 17-22
  Ordinary Charging 17-23
  Battery Testing Chart (Conventional Type Battery) 17-24
Alternator 17-26
  Alternator Removal 17-26
  Alternator Installation 17-26
  Alternator Disassembly 17-26
  Alternator Assembly 17-28
  Alternator Operational Inspection 17-29
  Stator Coil Inspection 17-30
  Rotor Coil Inspection 17-30
  Slip Ring Cleaning 17-30
  Slip Ring Diameter 17-30
  Carbon Brush Length 17-30
  Rectifier Inspection 17-31
  Regulator Inspection 17-31
  Alternator Ball Bearing Inspection 17-31
Electric Starter System 17-33
  Starter Motor Removal 17-33
  Starter Motor Installation 17-33
  Starter Motor Disassembly 17-33
  Starter Motor Assembly 17-35
  Carbon Brush Inspection 17-36
  Yoke Inspection 17-36
  Brush Plate Inspection 17-37
  Commutator Cleaning/Inspection. 17-37
  Armature Inspection 17-37
  Pinion Gear Inspection 17-38
  Starter Switch Inspection 17-38
  Starter Circuit Relay Inspection ... 17-38
Preheating System 17-40
  Glow Plug Removal 17-40
  Glow Plug Installation 17-40
  Glow Plug Inspection 17-40
  Preheating Timer Inspection 17-41
  Glow Plug Relay Inspection 17-41
  Glow Plug Relay Installation 17-41
Fuel Cut Solenoid 17-43
  Fuel Cut Solenoid 17-43
  Fuel Cut Solenoid Inspection 17-43
Radiator Fan 17-44
  Radiator Fan Circuit Inspection 17-44
  Radiator Fan Motor Inspection 17-44
  Radiator Fan Breaker Inspection . 17-44
  Radiator Fan Relay Inspection 17-45
Meter 17-47
  Hour Meter Installation 17-47
Lighting System 17-48
  Headlight Beam Adjustment 17-48
  Headlight Bulb Replacement 17-48
  Tail/Brake Light Replacement 17-49
  Light Switch Bulb Replacement ... 17-49
  Indicator Light Bulb Replacement 17-50
  Speedometer Illumination Bulb Replacement 17-51
  Reverse Light Switch Installation (Europe Model) 17-52
Switches and Sensors 17-54
  Brake Light Switch Inspection 17-54
  Radiator Fan Switch Inspection ... 17-54
  Coolant Temperature Switch Inspection 17-55
  Switch Inspection 17-56
  Speed Sensor Removal 17-56
  Speed Sensor Installation 17-57
  Speed Sensor Inspection 17-57
Fuses 17-58
  Fuse Removal 17-58
  Fuse Installation 17-58
  Fuse Inspection 17-58

Exploded View

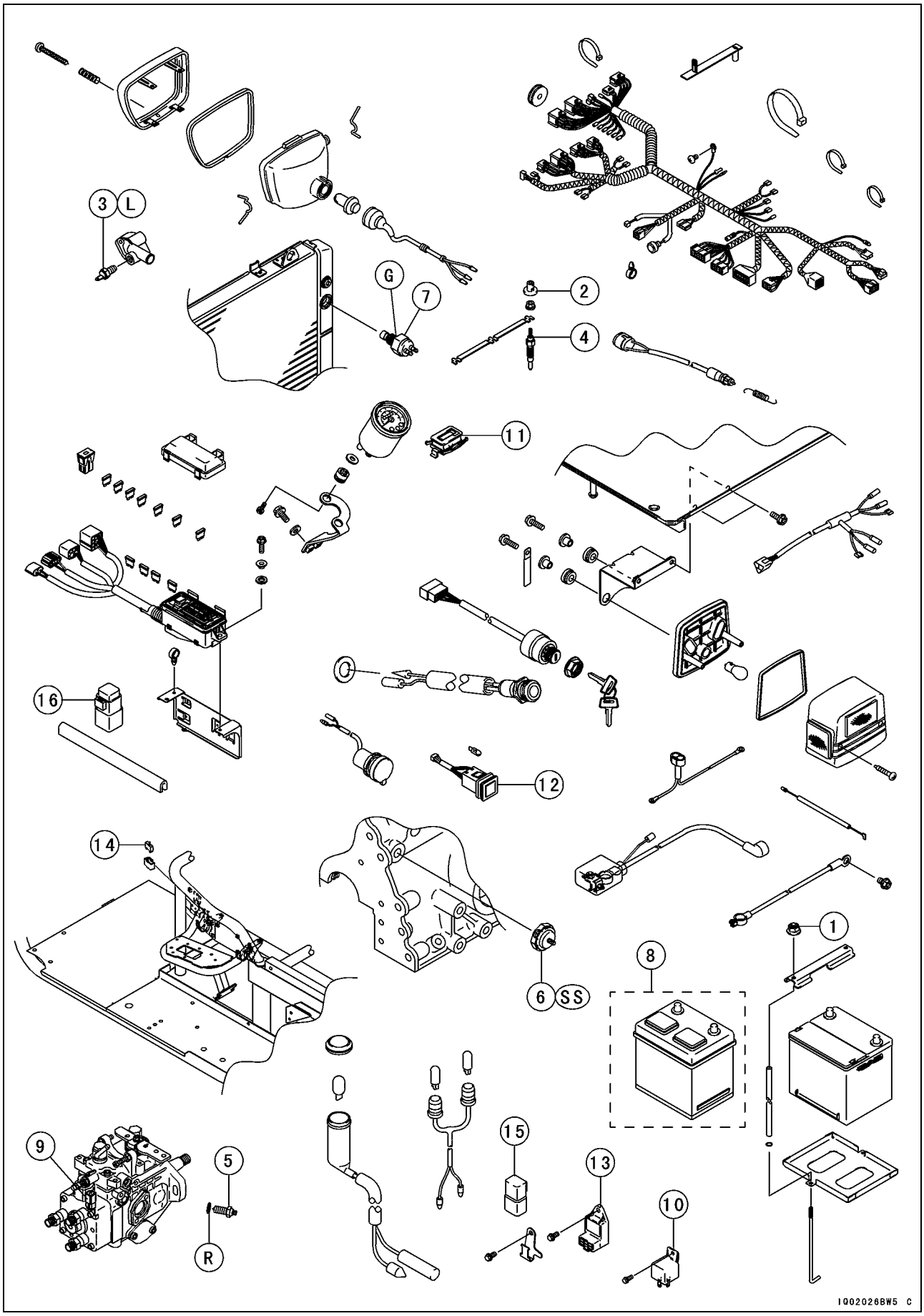


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Alternator Adjusting Bracket Bolts	20	2.0	15	
2	Alternator Mounting Bolt	39	4.0	29	
3	Alternator Pulley Locknut	11	1.1	97 in·lb	
4	Starter Motor End Cover Screws	1.5	0.15	13 in·lb	
5	Starter Motor Mounting Bolts	39	4.0	29	
6	Starter Motor Through Bolts	9.3	0.95	82 in·lb	

G: Apply grease.
R: Replacement Parts

Exploded View



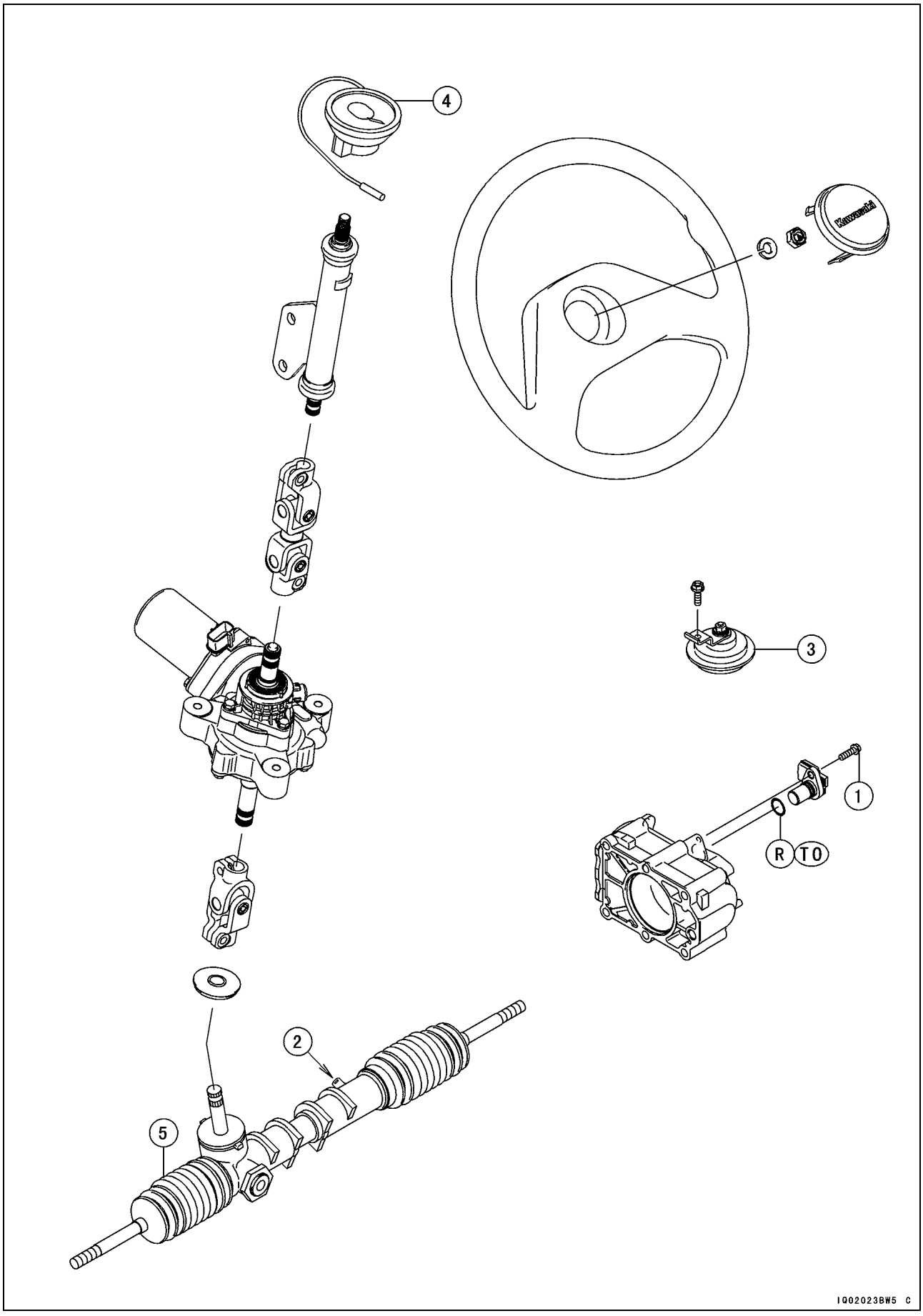
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Battery Holder Mounting Nuts	17	1.7	13	
2	Connecting Plate Nuts	1.2	0.12	11 in·lb	
3	Coolant Temperature Switch	27	2.8	20	L
4	Glow Plugs	17	1.7	13	
5	Neutral Switch	15	1.5	11	
6	Oil Pressure Switch	14	1.4	10	SS
7	Radiator Fan Switch	25	2.5	18	

8. EUR Model
9. Fuel Cut Solenoid Connector
10. Glow Plug Relay
11. Hour Meter
12. Light Switch
13. Preheating Timer
14. Radiator Fan Breaker
15. Radiator Fan Relay
16. Starter Circuit Relay

G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
SS: Apply silicone sealant.

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Speed Sensor Bolt	8.8	0.90	78 in·lb	

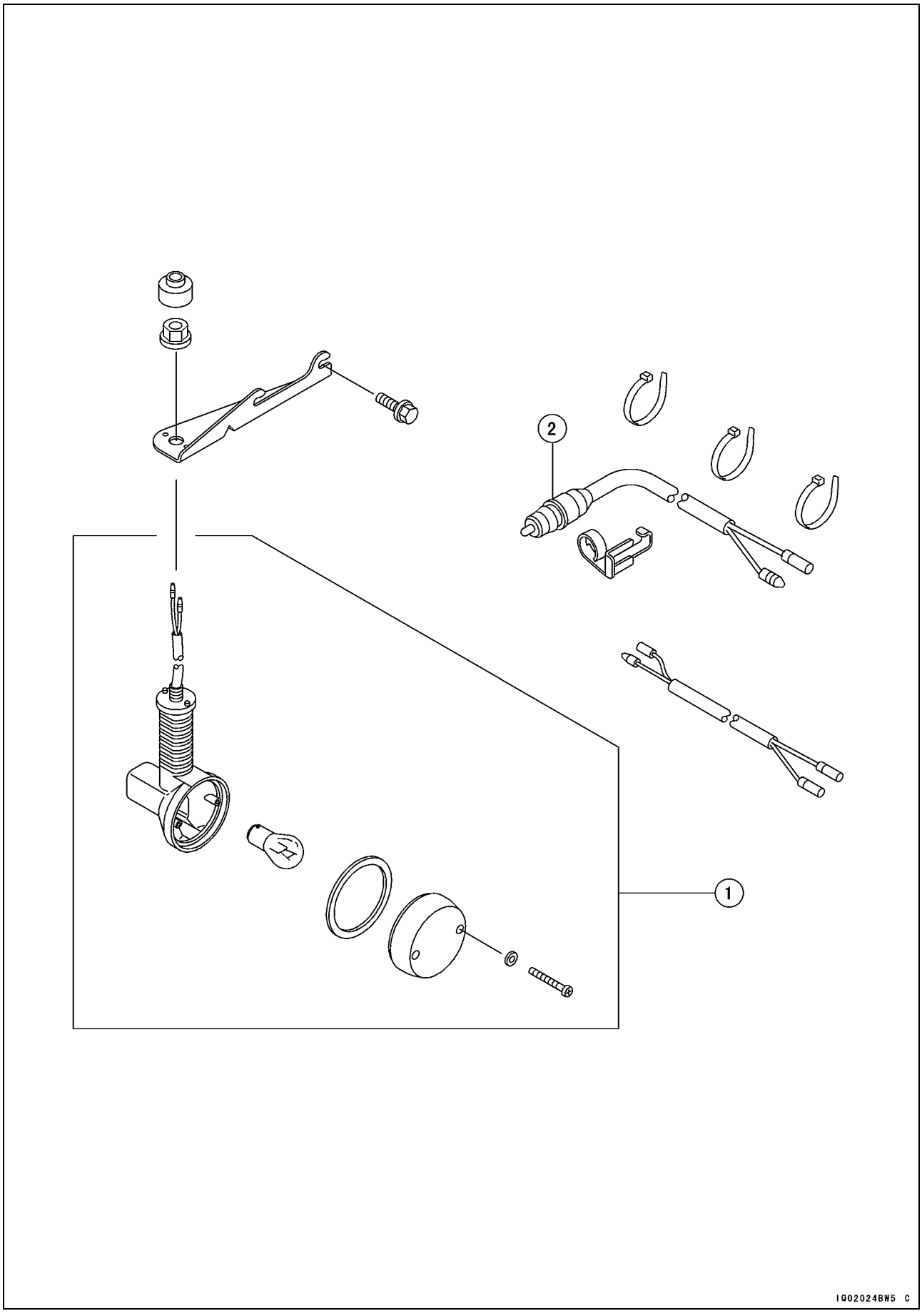
2. Ground Lead Connection
3. Horn
4. Horn Switch Contact
5. Steering Gear Assembly

R: Replacement Parts

TO: Apply transmission oil.

Exploded View

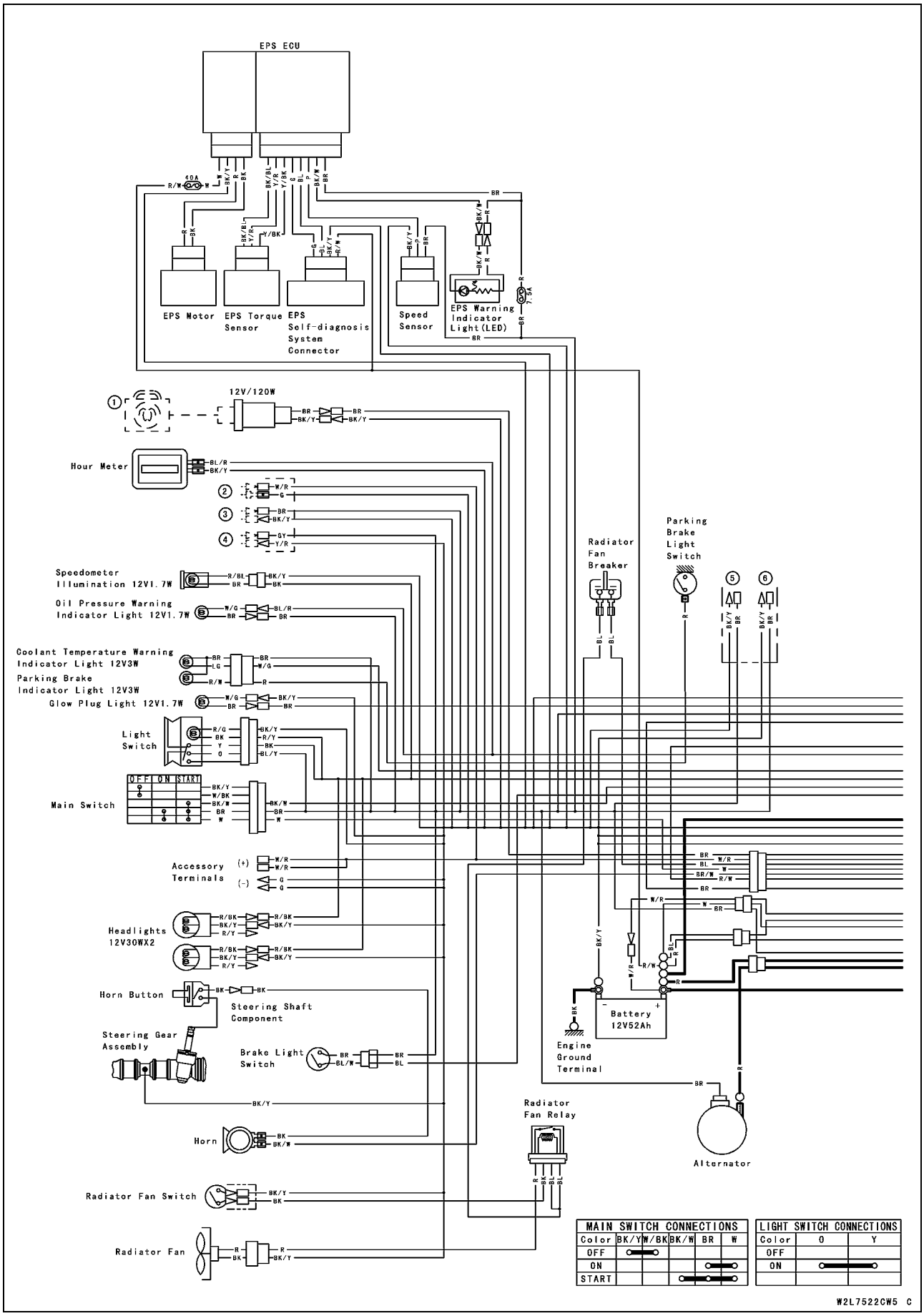
Europe Model



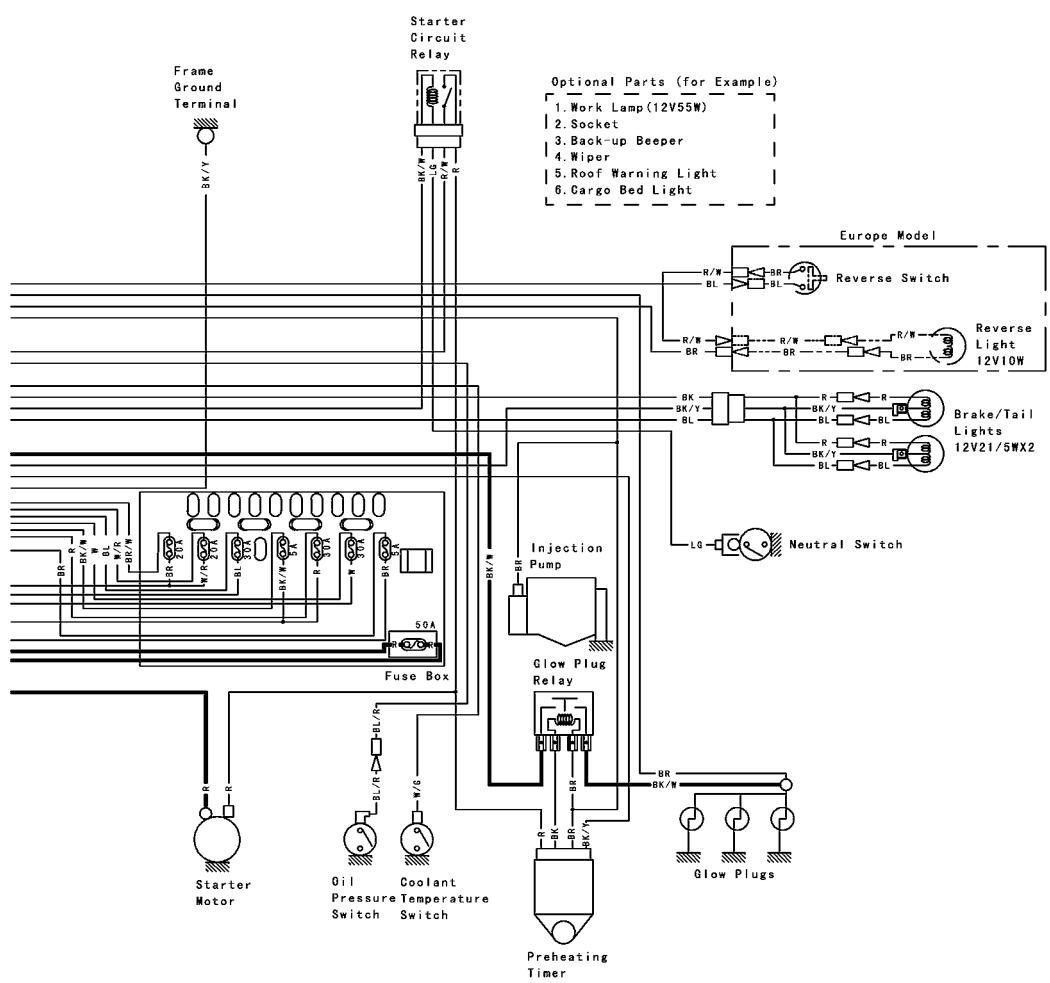
Exploded View

1. Reverse Light
2. Reverse Light Switch

Wiring Diagram



Wiring Diagram



BRAKE LIGHT SWITCH CONNECTIONS		
	BR	BL/W
When brake pedal is pushed down		

PARKING BRAKE LIGHT SWITCH CONNECTIONS		
	Terminal	Ground
When parking brake lever is pulled up		

NEUTRAL SWITCH CONNECTIONS		
	Terminal	Ground
Neutral(N)Position		

(98052-7522C, 7523C, 7525C)

Color Code	
BK	Black
BL	Blue
BR	Brown
G	Green
GY	Gray
LB	Light Blue
LG	Light Green
O	Orange
P	Pink
PU	Purple
R	Red
W	White
Y	Yellow

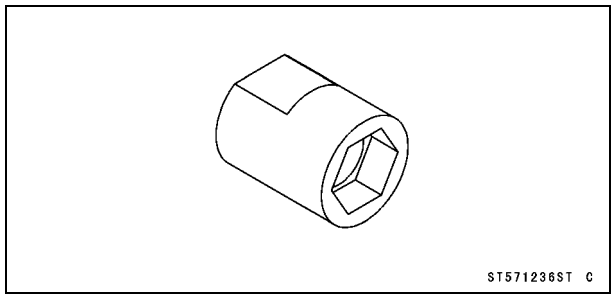
W2R7522CW5 C

Specifications

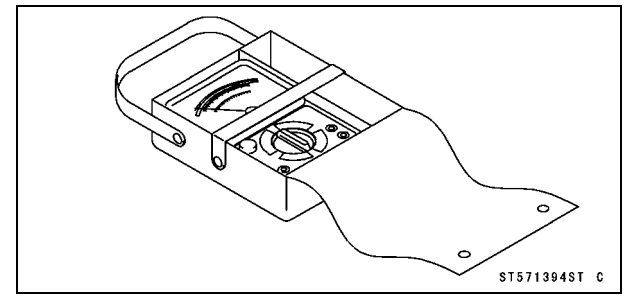
Item	Standard	Service Limit
Battery		
Capacity	12 V 52 Ah	– – –
Voltage	12.6 V or more	– – –
Conventional Type:		
Electrolyte Level	Between upper and lower level	– – –
Specific Gravity	1.265 at 20°C (68°F)	– – –
Alternator		
Type	Three-phase (built-in regulator/rectifier)	– – –
Fan Belt Deflection	9.5 ~ 11.5 mm (0.37 ~ 0.45 in.) at 98 N (10 kgf, 22 lb)	– – –
Output Voltage	13.3 ~ 14.8 V at 25°C (77°F)	– – –
Output Amperage (no load)	10 A or less	– – –
Output Amperage (load)	20 A or more	– – –
Stator Coil Resistance	0.2 Ω or less	– – –
Rotor Coil Resistance	2.8 ~ 3.0 Ω	– – –
Slip Ring Diameter	14.4 mm (0.57 in.)	14.0 mm (0.55 in.)
Carbon Brush Length (Projected Portion)	10.5 mm (0.41 in.)	8.4 mm (0.33 in.)
Electric Starter System		
Starter Motor:		
Carbon Brush Length	15.5 mm (0.61 in.)	11.0 mm (0.43 in.)
Commutator Diameter	30 mm (1.18 in.)	29 mm (1.14 in.)
Preheating System		
Glow Plug Resistance	About 0.1 ~ 5.0 Ω	– – –
Switches and Sensors		
Brake Light Switch Timing	ON after 10 mm (0.39 in.) of pedal travel	– – –
Radiator Fan Switch Resistance:		
Rising Temperature	From OFF to ON at 86 ~ 90°C (187 ~ 194°F)	– – –
Falling Temperature	From ON to OFF at 81 ~ 85°C (178 ~ 185°F)	– – –
	ON: Less than 0.5 Ω	
	OFF: More than 1 MΩ	
Coolant Temperature Switch Resistance:		
Rising Temperature	From OFF to ON at 112 ~ 118°C (234 ~ 244°F)	– – –
Falling Temperature	From ON to OFF within 10°C (50°F) of “ON” temperature	– – –
	ON: Less than 0.5 Ω	
	OFF: More than 1 MΩ	

Special Tools

Socket Wrench, Hex 22:
57001-1236

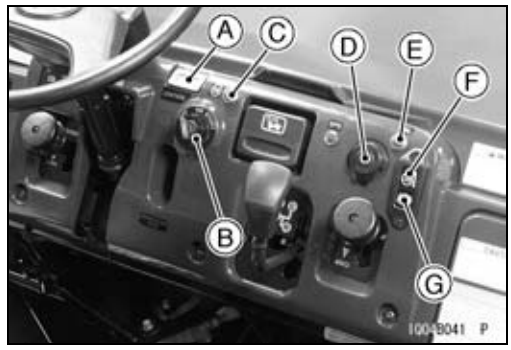


Hand Tester:
57001-1394

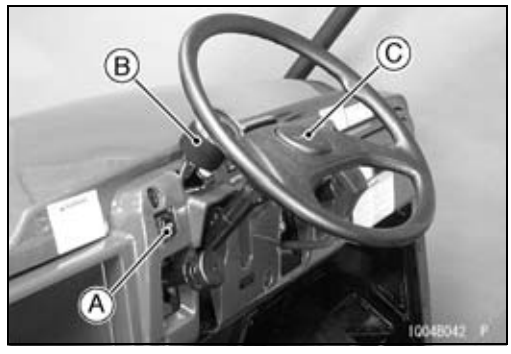


Parts Location

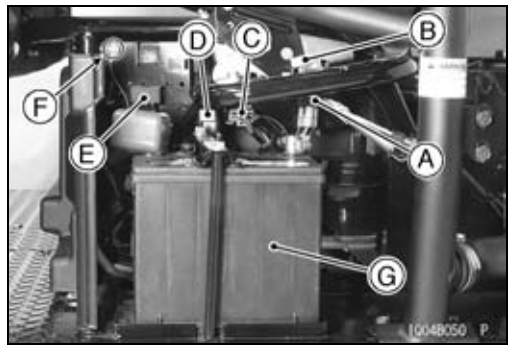
Hour Meter [A]
Main Switch [B]
Glow Plug Light [C]
Power Outlet Connector [D]
Oil Pressure Warning Indicator Light [E]
Coolant Temperature Warning Indicator Light [F]
Parking Brake Indicator Light [G]



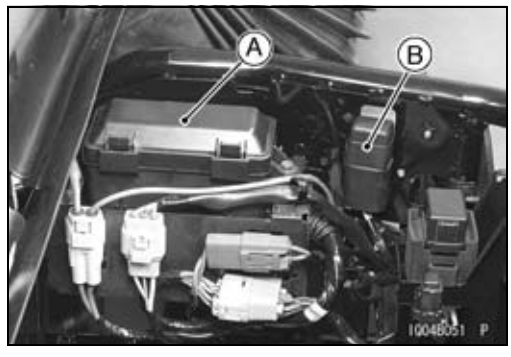
Light Switch [A]
Speedometer [B]
Horn Button [C]



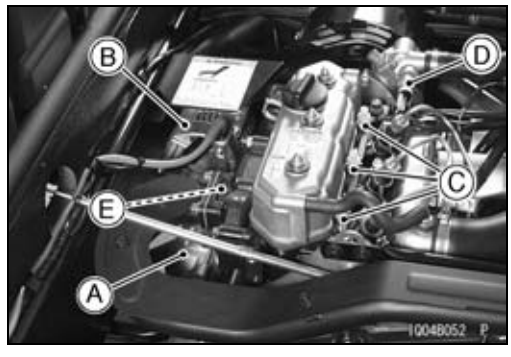
Glow Plug Relay [A]
Parking Brake Light Switch [B]
Preheating Timer [C]
Radiator Fan Relay [D]
Radiator Fan Breaker [E]
Frame Ground Terminal [F]
Battery 12 V 52 Ah [G]



Fuse Box [A]
Starter Circuit Relay [B]



Starter Motor [A]
Alternator [B]
Glow Plugs [C]
Coolant Temperature Switch [D]
Engine Ground Terminal [E]

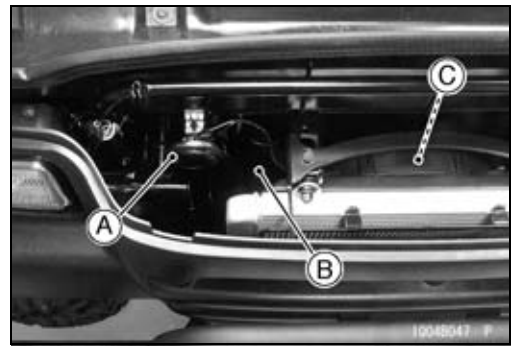


Parts Location

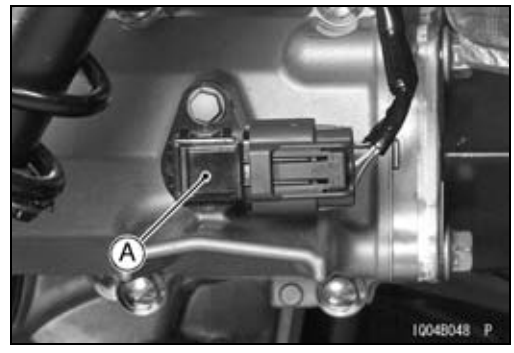
Oil Pressure Switch [A]
Fuel Cut Solenoid Valve [B]
Neutral Switch [C]



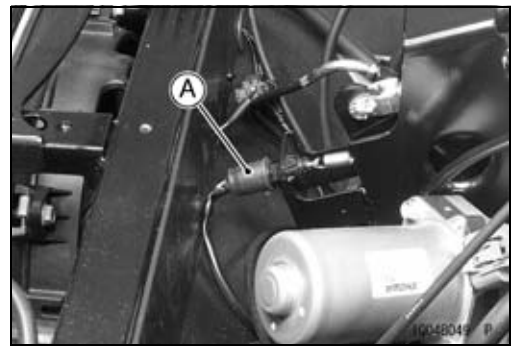
Horn [A]
Radiator Fan Switch [B]
Radiator Fan [C]



Speed Sensor [A]



Brake Light Switch [A]



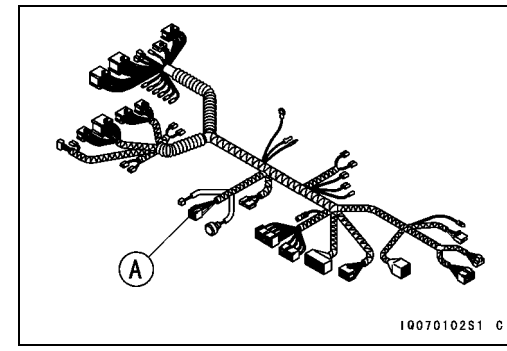
Precautions

There are a number of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

- Do not reverse the battery cable connections. This will burn out the diodes in the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery cables or any other electrical connections when the main switch is ON, or while the engine is running.
- Because of the large amount of current, never keep the main switch turned to the start position when the starter motor will not turn over, or the current may burn out the starter motor windings.
- Do not short the cables that are directly connected to the battery positive (+) terminal to the chassis ground.
- Troubles may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the failure. If the failure was brought on by some other item or items, they too must be repaired or replaced, or the replacement part will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).

Electrical Wiring

Wiring Inspection



- Visually inspect the wiring for signs of burning, fraying, etc.

★If any wiring is poor, replace the damaged wiring.

- Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.

★If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.

- Check the wiring for continuity.

○Use the wiring diagram to find the ends of the lead which is suspected of being a problem.

○Connect the hand tester between the ends of the leads.

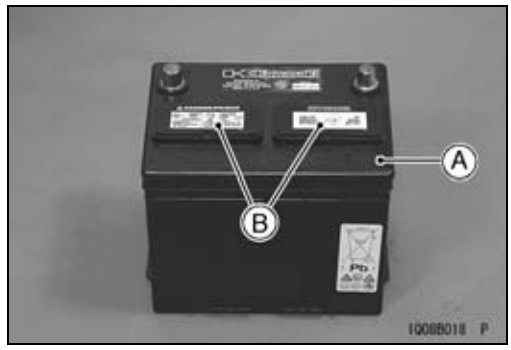
Special Tool - Hand Tester: 57001-1394

○Set the tester to the ×1 Ω range, and read the tester.

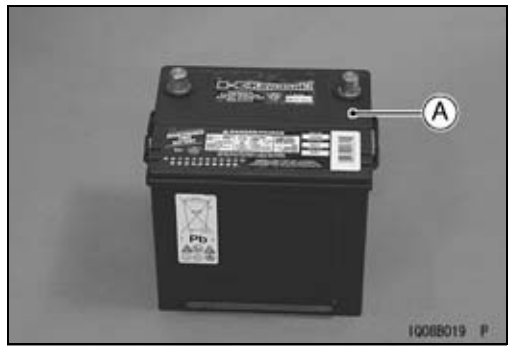
★If the tester does not read 0 Ω, the lead is defective. Replace the lead or the wiring harness if necessary.

Battery

○In this model, two batteries are prepared.
Conventional Type Battery [A] (Other Than US Model)
The caps [B] can be removed.

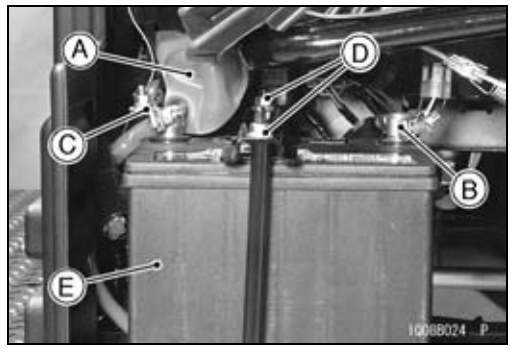


Sealed Type Battery [A] (US Model)



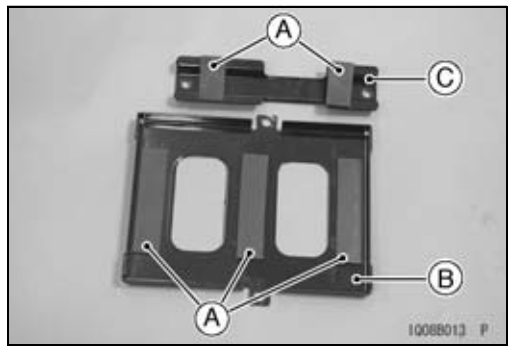
Battery Removal

- Slide the positive terminal cover [A] out.
- Disconnect the battery negative (–) cable and lead [B] first, and then the positive (+) cable and leads [C].
- Remove:
  Battery Holder Mounting Nuts [D]
  Battery Holder
- Remove the battery [E].

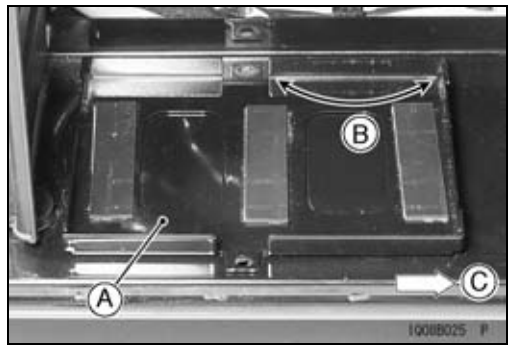


Battery Installation

- Check that the rubber dampers [A] on the battery case [B] and battery holder [C] are properly in place.



○Install the battery case [A] so that the long side [B] faces rear side [C].

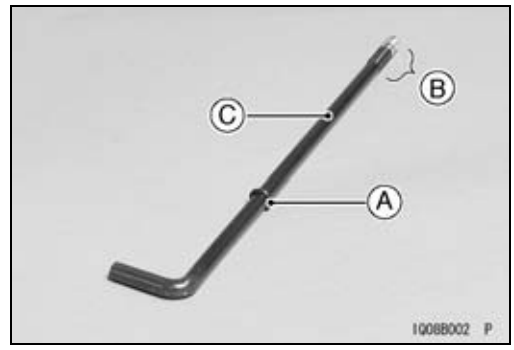


Battery

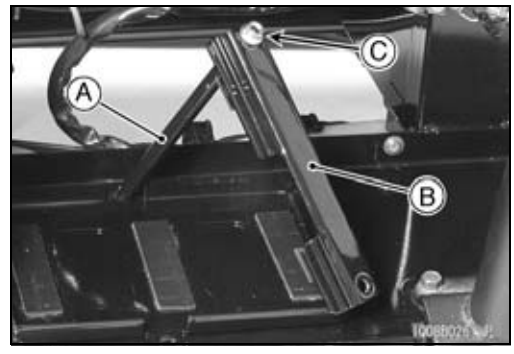
- Install the O-rings [A] from the opposite end of the threads [B] of each battery holder rod [C] to protect the O-rings.

NOTE

○*Do not set the O-ring on the threads of the rod.*

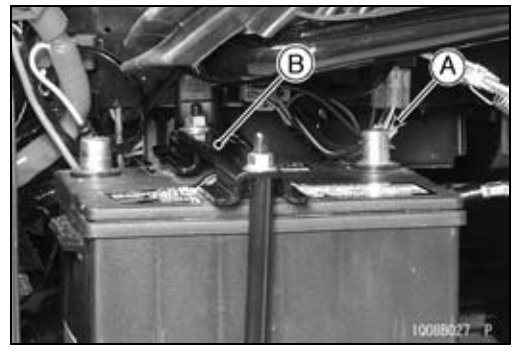


- Install:
  Battery Holder Rod (Right Side)
  Pipe [A]
  For Conventional Type Battery: 206.5 mm (8.13 in.)
  For Sealed Type Battery: 199.5 mm (7.85 in.)
  Battery Holder [B]
- Tighten the battery holder mounting nut [C] lightly.

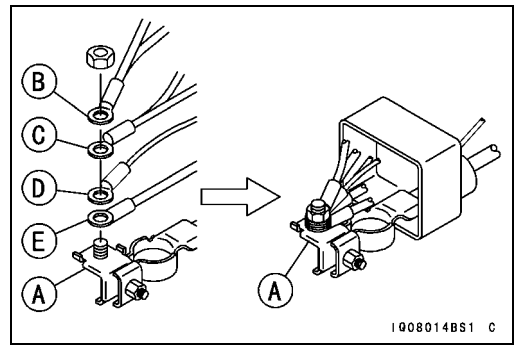


- Put the battery on the case so that the positive terminal [A] faces right side.
- Install:
  Battery Holder [B]
  Battery Holder Rod (Left Side)
  Pipe and Nut
- Tighten:

Torque - Battery Holder Mounting Nuts: 17 N·m (1.7 kgf·m, 13 ft·lb)



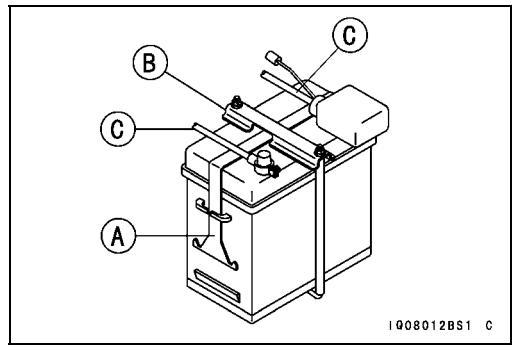
- Connect the four leads on the positive lead connector [A] as shown in the figure.
  Red/White, Red [B]
  Blue, White [C]
  Black/White [D]
  Red (Alternator Lead) [E]
- Connect the positive (+) cable and leads first, and then connect the negative (–) cable and lead (black and black/yellow).
- Put a light coat of grease on the terminals to prevent corrosion.
- Cover the positive terminals with the positive terminal cover.



Battery

(for Sealed Type Battery)

- Confirm the position of the battery handle [A] is below the holder [B] and cables [C] as shown in the figure.



Electrolyte Level Inspection (Conventional Type Battery)

- Refer to the Electrolyte Level Inspection (Conventional Type Battery) in the Periodic Maintenance chapter.

Electrolyte Specific Gravity Inspection (Conventional Type Battery)

- Refer to the Electrolyte Specific Gravity Inspection (Conventional Type Battery) in the Periodic Maintenance chapter.

Charging Condition Inspection (Conventional Type Battery)

- Refer to the Charging Condition Inspection (Conventional Type Battery) in the Periodic Maintenance chapter.

Initial Charging (Conventional Type Battery)

⚠ WARNING

Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals which could ignite any battery gases.

CAUTION

Charging the battery at a rate higher than specified may ruin the battery. Charging at a high rate causes excess heat which can warp the plates and cause internal shorting. Higher-than-normal charging rates also cause the plates to shed active material. Deposits will accumulate, and can cause internal shorting

If the temperature of the electrolyte rises above 45°C (113°F) during charging, reduce the charging rate to lower the temperature, and increase charging time proportionately.

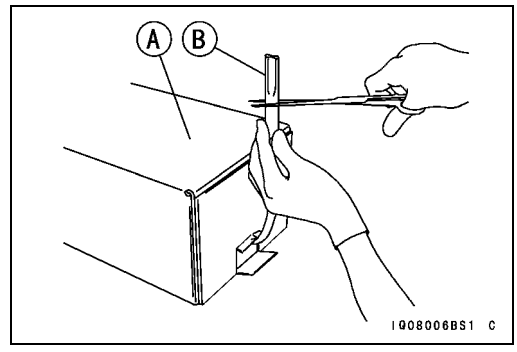
Battery

- Remove:
  Battery (see Battery Removal)
  Filler Caps (see Electrolyte Level Inspection (Conventional Type Battery))

⚠ WARNING

Electrolyte contains sulfuric acid which is harmful to skin, eyes, and clothing.
Wear eye protection and rubber gloves.
If spillage occurs on body or clothing, rinse at once with water for at least 15 minutes.

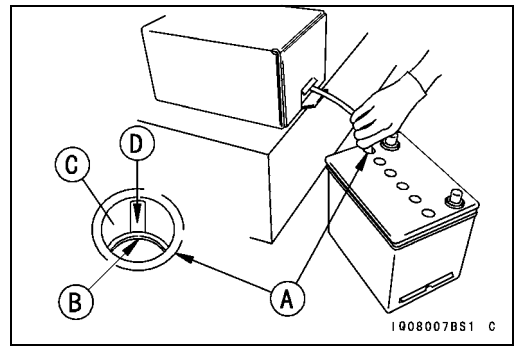
- Place the carton [A] on a flat surface as shown in the figure, pull the tab back to edge of the carton.
- Pull out the hose [B] and cut off end of the hose.



- Fill each cell [A] until the electrolyte level rises to bottom [B] of the split ring [C] of the vent well.

CAUTION

Do not fill into the split [D]. Do not overfill.



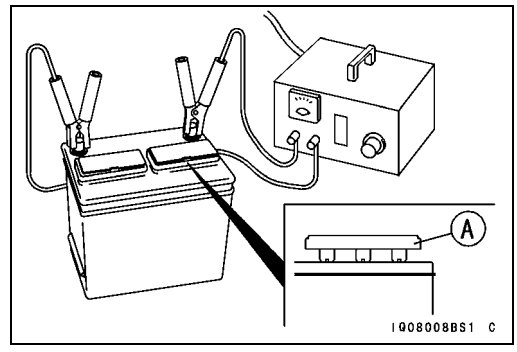
- After filling cells, wait five to ten minutes.

★If necessary to bring electrolyte to proper level, add the additional electrolyte.

⚠ WARNING

Neutralize any residue with baking soda.
Rinse empty package with large quantities of water.
Destroy empty package to prevent accidents!

- Place the strips of filler caps [A] loosely over the filler ports.
- Charge the battery at 15 amps until specific gravity of electrolyte rises to 1.250 and a temperature of 15.5°C (60°F) (Both conditions must be met.).



Battery

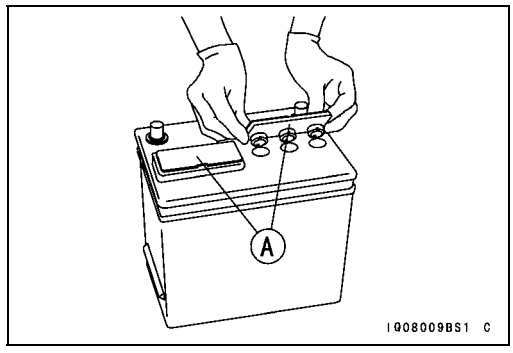
★If violent gassing or spewing occurs, reduce the charge rate.

CAUTION

Never allow a battery to get HOT to the touch. If the battery is excessively hot to the touch, discontinue charging immediately.
Allow the battery to cool down before monitoring gravities or continuing charge.

● After charging, if the electrolyte level has fallen, refill the battery with the electrolyte to upper level.

● Fit the filler caps [A] firmly.



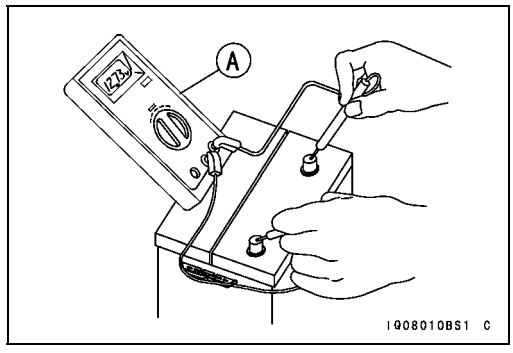
Charging Condition Inspection (Sealed Type Battery)

Battery charging condition can be checked by measuring battery terminal voltage.

● Remove the battery (see Battery Removal).

CAUTION

Be sure to disconnect the negative (−) cable first.



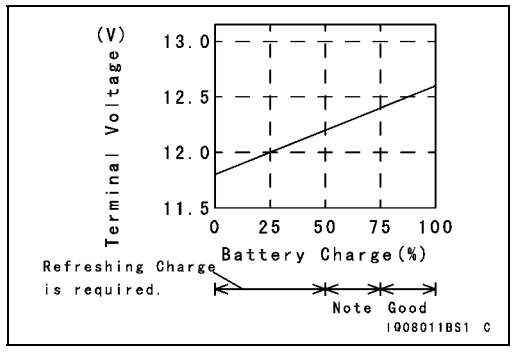
● Measure the battery terminal voltage.

NOTE

○*Measure with a digital voltmeter [A] which can be read to one decimal place voltage.*

★If the reading is below the specified, refreshing charge is required.

Battery Terminal Voltage
Standard: 12.6 V or more



Battery

Ordinary Charging

⚠ WARNING

Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals which could ignite any battery gases.

CAUTION

Always remove the battery from the vehicle for charging. If the battery is charged while still installed, battery electrolyte may spill and corrode the frame or other parts of the vehicle.
Charging the battery at a rate higher than specified may ruin the battery. Charging at a high rate causes excess heat which can warp the plates and cause internal shorting.
Higher-than-normal charging rates also cause the plates to shed active material. Deposits will accumulate, and can cause internal shorting.
If the temperature of the electrolyte rises above 45°C (113°F) during charging, reduce the charging rate to lower the temperature, and increase charging time proportionately.

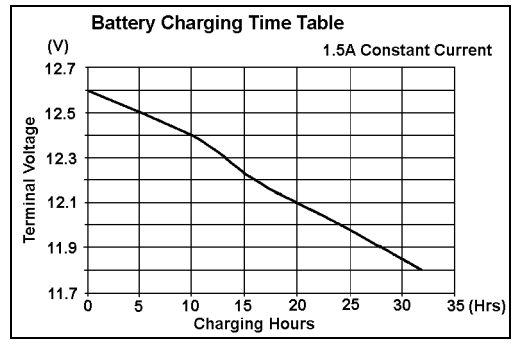
- Remove the battery (see Battery Removal).

NOTE

○*Never attempt to charge a frozen battery.*
○*Allow it to warm up to room temperature before charging.*
○*Never leave a battery on a trickle charger longer than 48 hours. Serious damage to the battery will occur.*

(Conventional Type Battery)

- Charge the battery with a current of 1 to 1.5 amps until the specific gravity rises to 1.250 and temperature reaches 15.5°C (60°F).
- Refer to the Battery Charging Time Table for the charging.



Battery

● Check the electrolyte level after charging.
★ If the electrolyte level is low add water only after initial activation.

⚠ WARNING

Electrolyte contains sulfuric acid which is harmful to skin, eyes, and clothing.
Wear eye protection and rubber gloves.
If spillage occurs on body or clothing, rinse at once with water for at least 15 minutes.

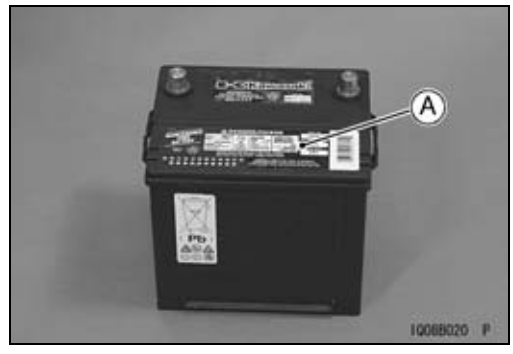
● Turn the charger off or plug it, then disconnect it from the battery.
★ If the battery condition indicates that it is not fully charged, additional charging time is necessary.

(Sealed Type Battery)
● Charge the battery according to the battery terminal voltage.

⚠ WARNING

This battery is sealed battery type. Never remove seal sheet or cap [A] even at charging. Never add water. Charge with current and time as stated below.

● Refer to the Battery Charging Time Table for the charging.



Battery Charging Time Table **at 27°C (80°F)**

Battery Voltage	State of Charge	Charging Time to Full Charge		
		2 A	6 A	10 A
12.6 V	100%	Full Charge		
12.4 V	75%	405 min.	135 min.	81 min.
12.2 V	50%	810 min.	270 min.	162 min.
12.0 V	25%	1 215 min.	405 min.	243 min.
11.8 V	0%	1 620 min.	540 min.	324 min.

● Determine battery condition after charging.
○ Determine the condition of the battery 30 minutes after completion of the charge by measuring the terminal voltage according to the table below.

Criteria	Judgement
12.6 V or higher	Good
12.0 ~ 12.6 V or lower	Charge insufficient → Recharge
12.0 V or lower	Unserviceable → Replace

Battery Testing Chart (Conventional Type Battery)

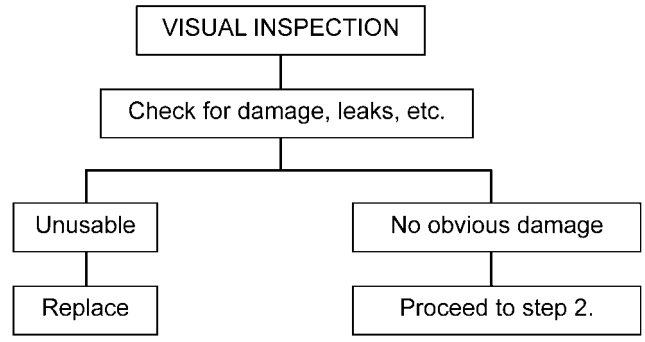
Once battery is in an adequate state of charge the following load test procedure will be valid. The load test is undertaken to determine if the battery has adequate electrical performance or if it has to be replaced.

Important: This procedure is valid only it the battery is at or above the state of check specified in STEP 2.

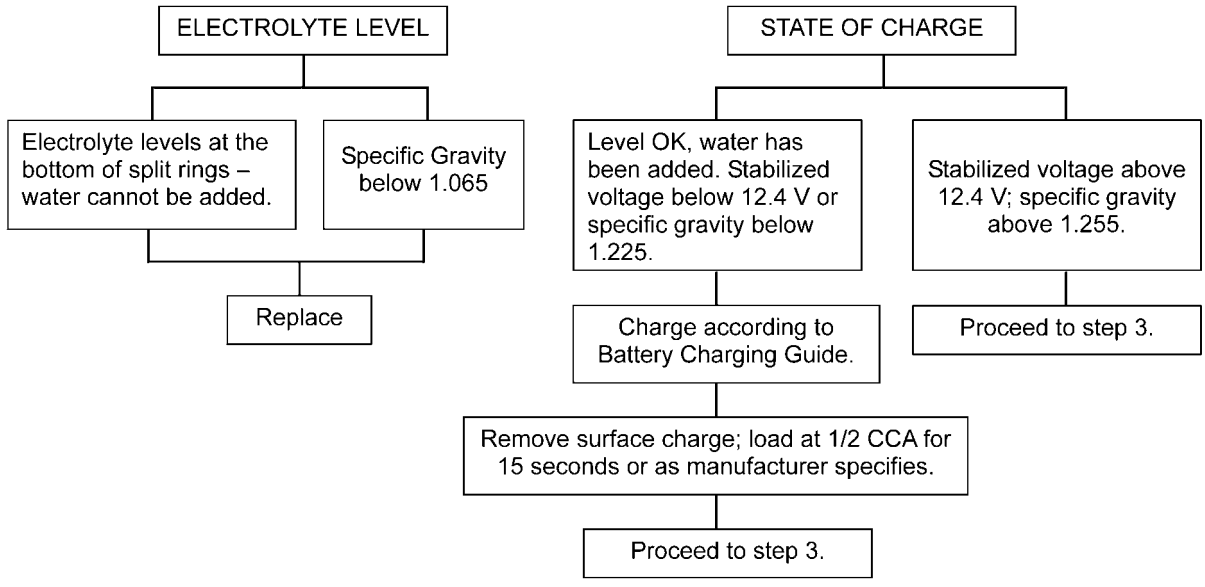
Battery

Battery Testing Chart

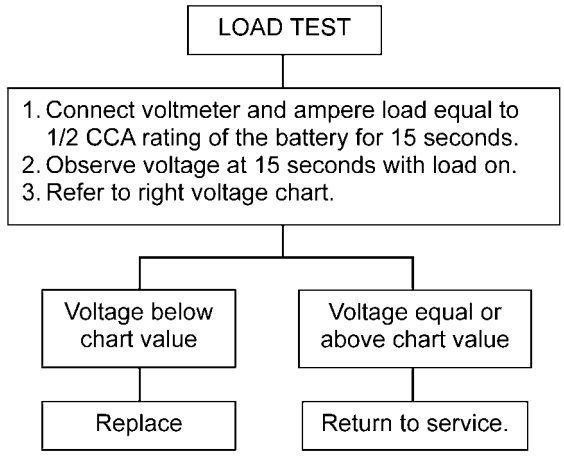
STEP 1



STEP 2


ELECTROLYTE LEVEL
STATE OF CHARGE
Electrolyte levels at the bottom of split rings – water cannot be added.
Specific Gravity below 1.065
Level OK, water has been added. Stabilized voltage below 12.4 V or specific gravity below 1.225.
Stabilized voltage above 12.4 V; specific gravity above 1.255.
Replace
Charge according to Battery Charging Guide.
Proceed to step 3.
Remove surface charge; load at 1/2 CCA for 15 seconds or as manufacturer specifies.
Proceed to step 3.

STEP 3


LOAD TEST
1. Connect voltmeter and ampere load equal to 1/2 CCA rating of the battery for 15 seconds.
2. Observe voltage at 15 seconds with load on.
3. Refer to right voltage chart.
Voltage below chart value
Voltage equal or above chart value
Replace
Return to service.

VOLTAGE CHART

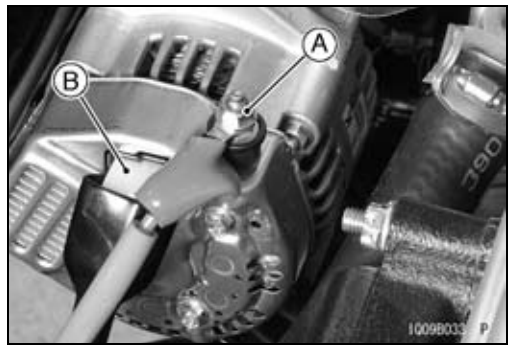
Estimated Electrolyte Temperature	Minimum required voltage under load at 15 seconds.
21°C (70°F) and above	9.6 V
16°C (60°F)	9.5 V
10°C (50°F)	9.4 V
4°C (40°F)	9.3 V
-1°C (30°F)	9.1 V
-7°C (20°F)	8.9 V
-12°C (10°F)	8.7 V
-17.8°C (0°F)	8.5 V

IQ08013B F

Alternator

Alternator Removal

- Remove:
  Fan Belt Cover (see Cooling Fan Belt Inspection in the Periodic Maintenance chapter)
  Alternator Terminal Locknut [A]
  Alternator Lead Connector [B]



- Remove:
  Alternator Adjusting Bracket Bolt [A]
  Alternator Mounting Bolt [B]
  Alternator [C]



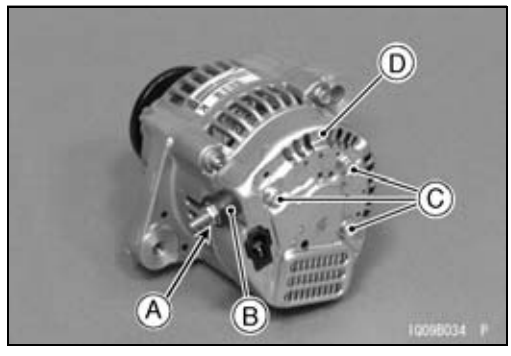
Alternator Installation

- Clean the alternator legs and alternator bracket where the alternator is grounded.
- Adjust the fan belt deflection (see Cooling Fan Belt Inspection in the Periodic Maintenance chapter).
- Tighten:

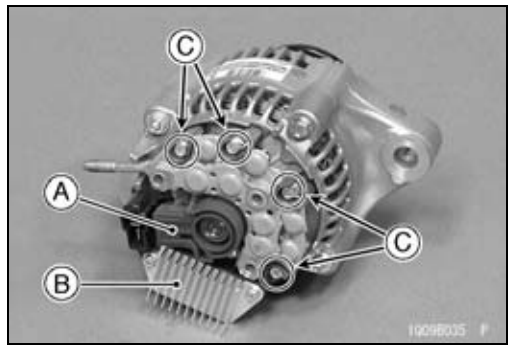
Torque - Alternator Adjusting Bracket Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)
Alternator Mounting Bolt: 39 N·m (4.0 kgf·m, 29 ft·lb)

Alternator Disassembly

- Remove:
  Terminal Nut [A]
  Insulator [B]
  End Cover Bolts [C]
  End Cover [D]

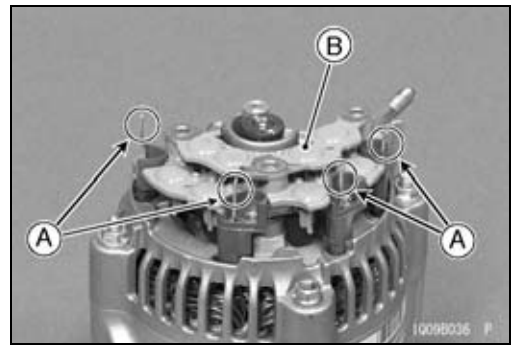


- Remove:
  Brush Holder [A]
  Regulator [B]
  Rectifier Screws [C]



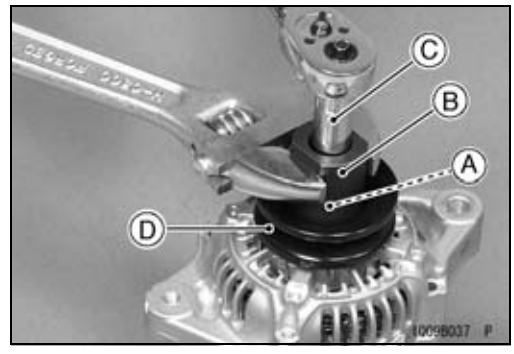
Alternator

- Straighten the stator coil wires [A].
- Remove the rectifier [B].

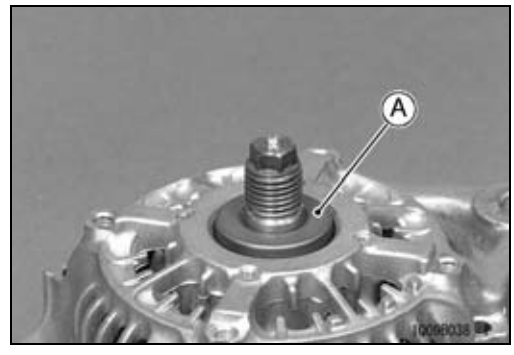


- Use the following, loosen the pulley locknut [A].
  Socket Wrench [B] (Special Tool: 57001-1236)
  Deep Socket Wrench [C]

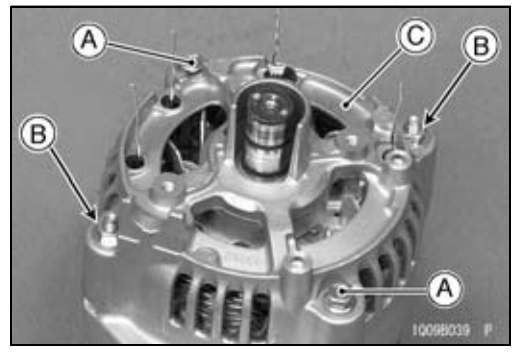
  Special Tool - Socket Wrench, Hex 22: 57001-1236
- Remove:
  Pulley Locknut
  Pulley [D]



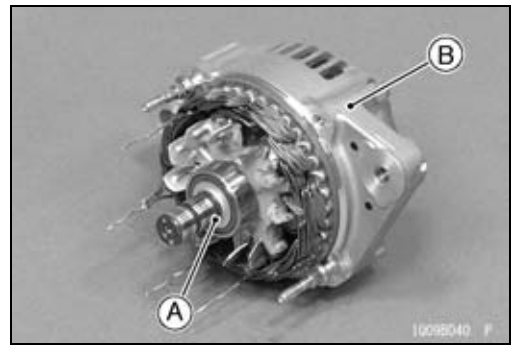
- Remove the collar [A].



- Remove:
  Housing Cover Mounting Bolts [A] and Nuts [B]
  Housing Cover [C]

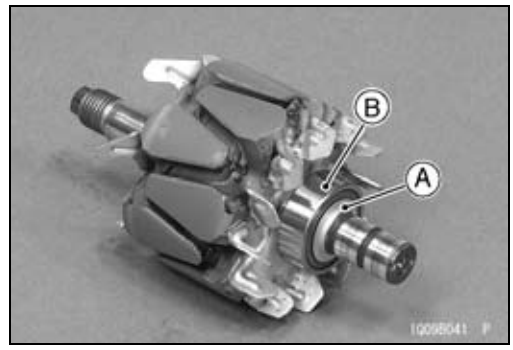


- Remove:
  Rotor [A]
  Alternator Housing [B]

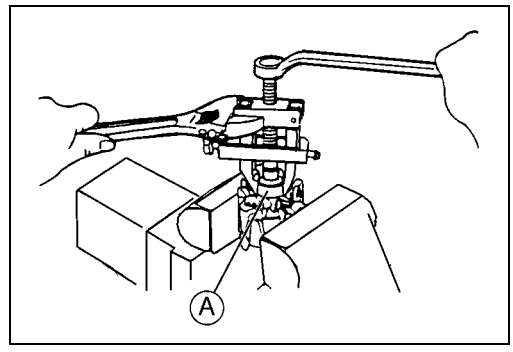


Alternator

● Remove:
Bearing Holder [A]
Ball Bearing [B]

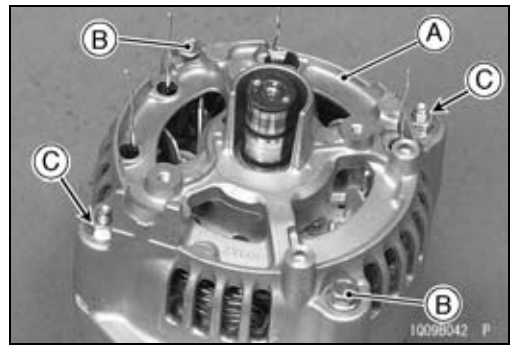


○To remove the ball bearing [A], use a suitable puller.

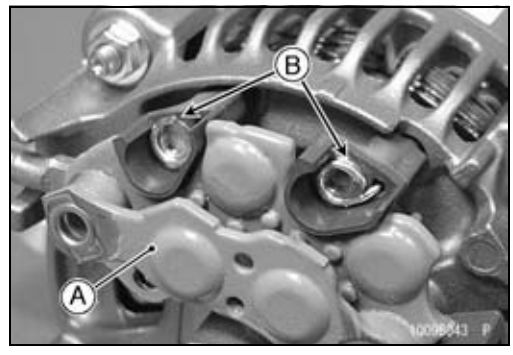


Alternator Assembly

● Press the bearing and bearing holder onto the rotor shaft.
● Straighten the stator coil wires.
● Install:
Housing Cover [A]
Housing Cover Mounting Bolts [B] and Nuts [C]

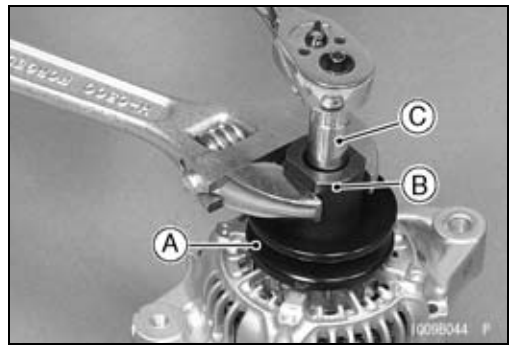


● Install the rectifier [A].
● Bend the stator coil wire ends [B] around the screw holes.
● Tighten the rectifier screws.



● Install:
Regulator
Brush Holder
End Cover
Insulator
Terminal Nut

Alternator



- Install:
  Collar
  Pulley [A]
- Use the following, tighten the locknut.
  Socket Wrench [B] (Special Tool: 57001-1236)
  Deep Socket Wrench [C]

Special Tool - Socket Wrench, Hex 22: 57001-1236

Torque - Alternator Pulley Locknut: 11 N·m (1.1 kgf·m, 97 in·lb)

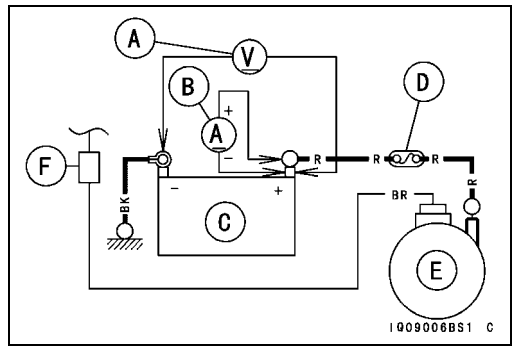
Alternator Operational Inspection

- Check the battery condition.
  Conventional Type Battery (see Charging Condition Inspection (Conventional Type Battery) in the Periodic Maintenance chapter)
  Sealed Type Battery (see Charging Condition Inspection (Sealed Type Battery))

NOTE

○*Always check the battery condition before condemning the alternator. The battery must be fully charged in order to conduct accurate alternator inspection.*

- Check the wiring (see Wiring Inspection).
- Warm up the engine to bring the components up to their normal operating temperatures.
- Stop the engine.
- Remove the 30 A fan fuse (see Fuse Removal).



- Connect the hand tester [A] (range DC 25 V) and ammeter [B] (range DC 40 A, after the engine start) as shown in the figure.
  Battery [C]
  50 A Fuse [D]
  Alternator [E]
  Load [F]
- Measure the alternator output voltage and amperage at 2 000 rpm with the light switch turned OFF.

Alternator Output Voltage
Standard: 13.3 ~ 14.8 V at 25°C (77°F)

Alternator Output Amperage (no load)
Standard: 10 A or less

- Stop the engine.
- Install the 30 A fan fuse (see Fuse Installation).
- Measure the alternator output voltage and amperage at 2 000 rpm with the light switch turned ON.

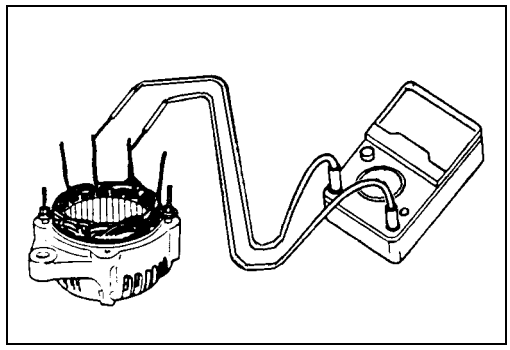
Alternator Output Voltage
Standard: 13.3 ~ 14.8 V at 25°C (77°F)

Alternator Output Amperage (load)
Standard: 20 A or more

★If the readings are not within the specified range, check the alternator.

Alternator

Stator Coil Inspection



- Connect the hand tester (× 1 Ω range) between the coil wires and read the tester.

Special Tool - Hand Tester: 57001-1394

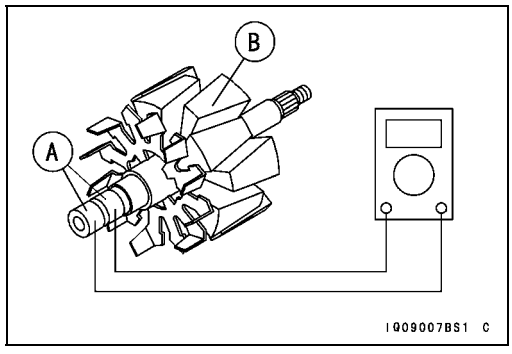
★If the tester does not read as specified, replace the alternator frame.

Stator Coil Resistance: 0.2 Ω or less

- Using the highest hand tester range, measure the resistance between the stator coil core and each of the coil windings.

★If there is any reading at all, the stator coil winding has a short and the alternator housing must be replaced.

Rotor Coil Inspection



- Connect the hand tester (× 1 Ω range) between the slip rings [A] and read the tester.

Special Tool - Hand Tester: 57001-1394

★If the tester does not read as specified, replace the rotor [B].

Rotor Coil Resistance: 2.8 ~ 3.0 Ω

- Using the highest tester range, measure the resistance between the rotor shaft and each of the slip rings.

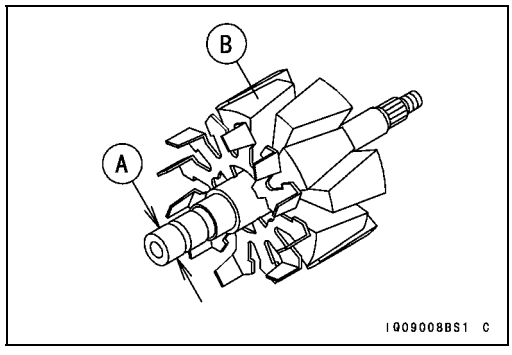
★If there is any reading at all, the rotor coil has a short and must be replaced.

Slip Ring Cleaning

- Visually inspect the slip ring for dirt or pitting.

★If necessary, smooth the slip ring with No. 300 ~ No. 500 emery cloth.

Slip Ring Diameter



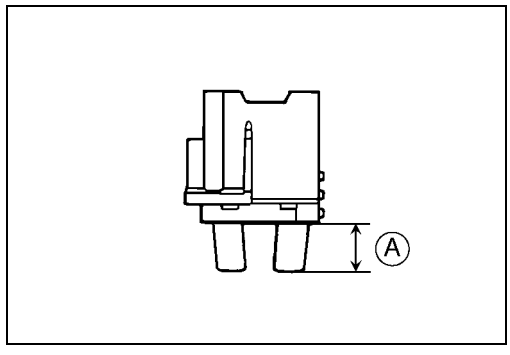
- Measure the diameter of the slip rings.

★If the measurement is less than the service limit, replace the rotor [A].

Slip Ring Diameter

Standard:	**14.4 mm (0.57 in.)**
Service Limit:	**14.0 mm (0.55 in.)**

Carbon Brush Length



- Measure the length [A] that both carbon brushes that stick out of the holder.

★If either one is worn down to less than the service limit, replace it.

Carbon Brush Length (Projected Portion)

Standard:	**10.5 mm (0.41 in.)**
Service Limit:	**8.4 mm (0.33 in.)**

Alternator

Rectifier Inspection

- Set the hand tester to the 1 kΩ range.
- Zero the hand tester, and connect it to each terminal to check the resistance in both directions.

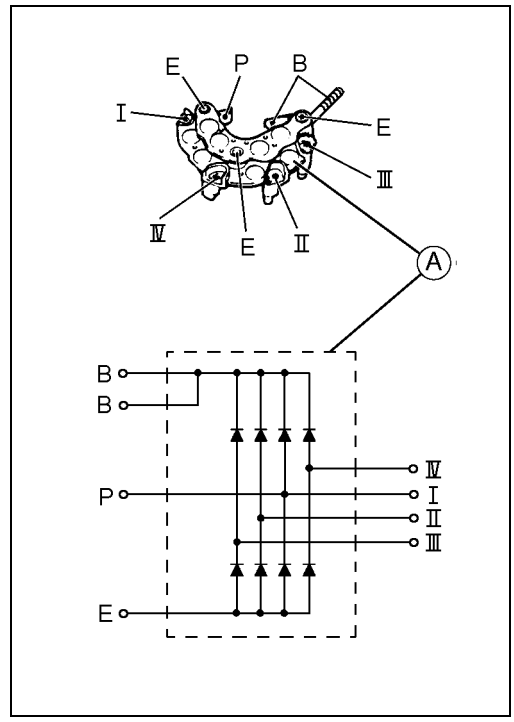
○The resistance should be low in one direction and more than ten times as much in the other direction. If the rectifier [A] shows low or high in both directions, the rectifier is defective and the rectifier must be replaced.

NOTE

○*The actual meter reading varies with the meter used and the individual rectifier, but, generally speaking, the lower reading should be from zero to one half the scale.*

CAUTION

If a megger or a meter with a large-capacity battery is used, the rectifier will be damaged.



Regulator Inspection

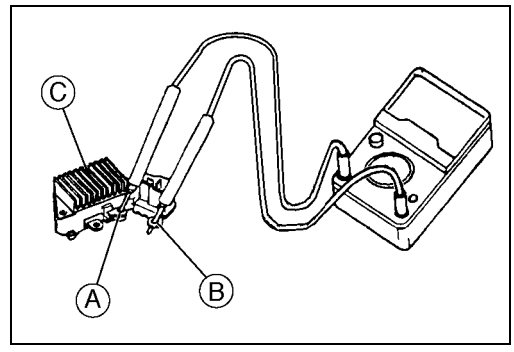
- Set the hand tester to the 1 kΩ range.

Special Tool - Hand Tester: 57001-1394

- Check the resistance between F [A] and B [B] terminals in both directions.

○The resistance should be low in one direction and more than ten times as much in the other direction.

★If the reading shows low or high in both directions, the regulator [C] is defective and must be replaced.



Alternator Ball Bearing Inspection

CAUTION

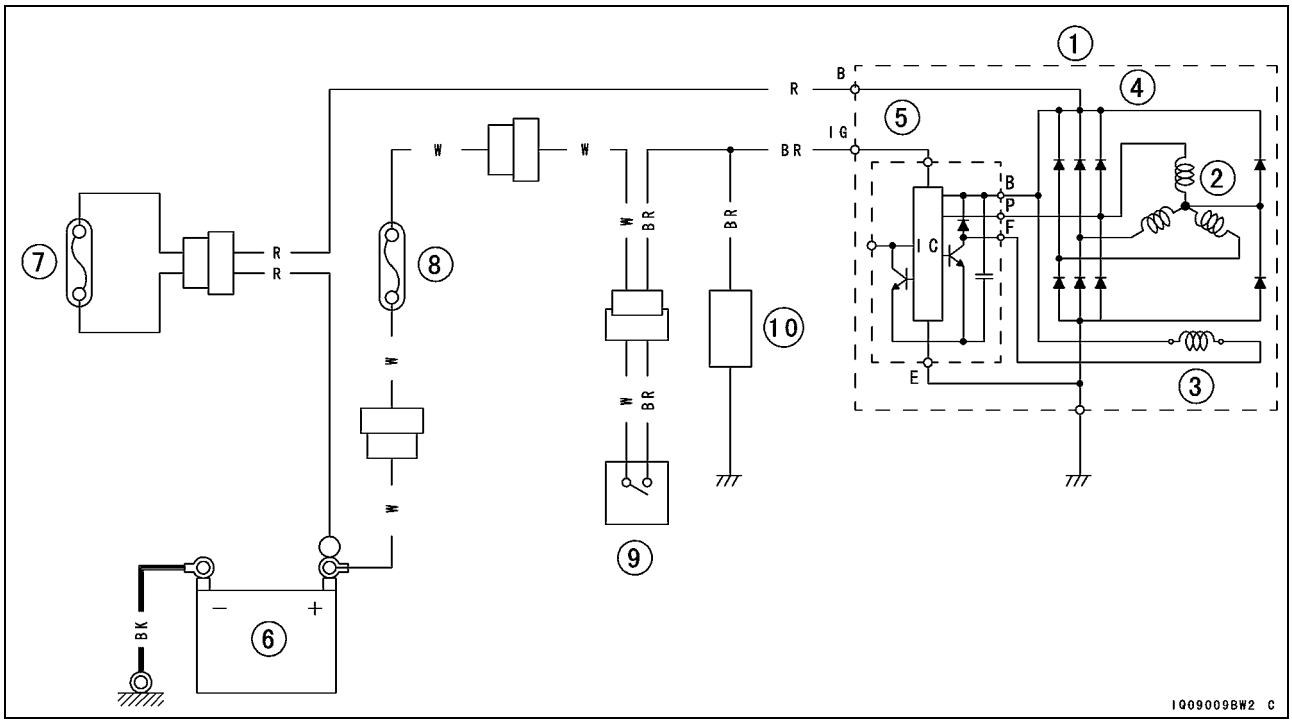
Do not disassemble the alternator for bearing inspection since disassembling the alternator damages the bearings.

- Turn the alternator rotor shaft back and forth while checking for play, roughness or binding of bearings.

★If bearing play, roughness, or binding is found, disassemble the alternator and replace the bearings.

Alternator

Alternator Circuit

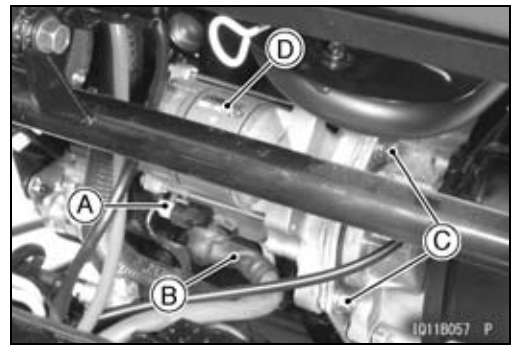


1. Alternator
2. Stator Coil
3. Rotor
4. Rectifier
5. Regulator
6. Battery
7. 50 A Fuse
8. 30 A Fuse
9. Main Switch
10. Load

Electric Starter System

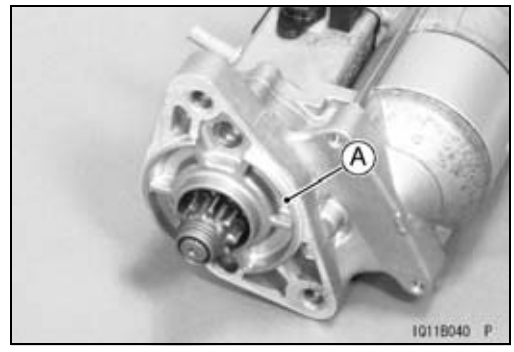
Starter Motor Removal

- Tilt up the cargo bed.
- Remove:
  Starter Motor Lead Connector [A]
  Starter Motor Cable [B]
  Starter Motor Mounting Bolts [C]
  Starter Motor [D]



Starter Motor Installation

- Clean the mating surface [A] of the starter motor and the end plate where the starter motor is grounded.

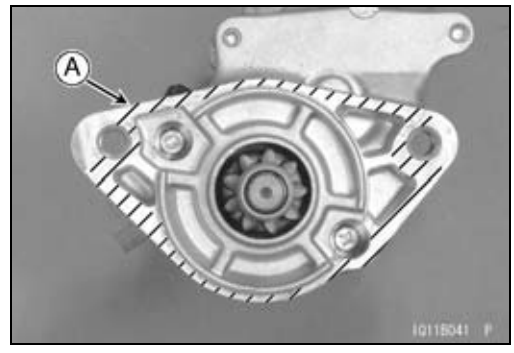


- Apply liquid gasket [A] to the mating surface as shown in the figure.

  Sealant - Three Bond: 1207F

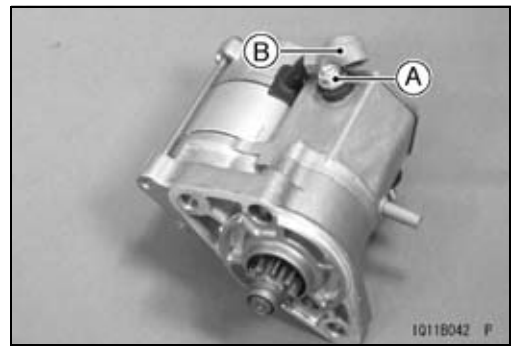
- Install the starter motor and tighten the mounting bolts.

  Torque - Starter Motor Mounting Bolts: 39 N·m (4.0 kgf·m, 29 ft·lb)

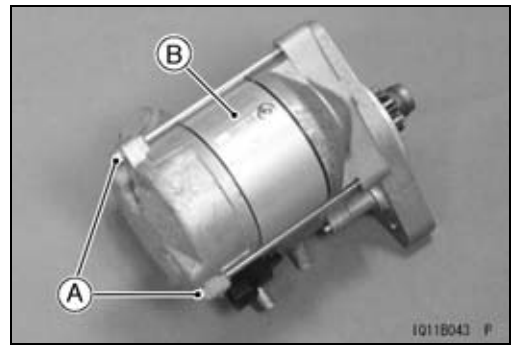


Starter Motor Disassembly

- Remove:
  Field Coil Cable Nut [A]
  Field Coil Cable [B]

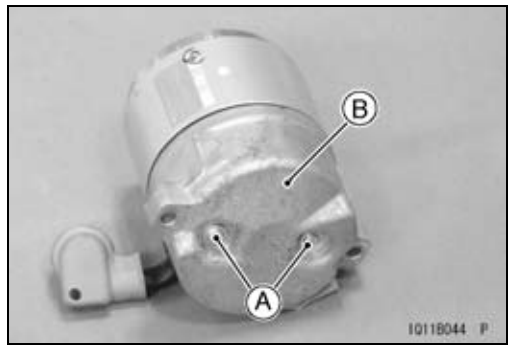


- Remove:
  Starter Motor Through Bolts [A]
  Yoke [B]

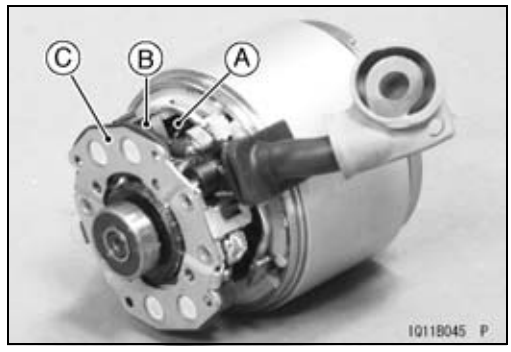


Electric Starter System

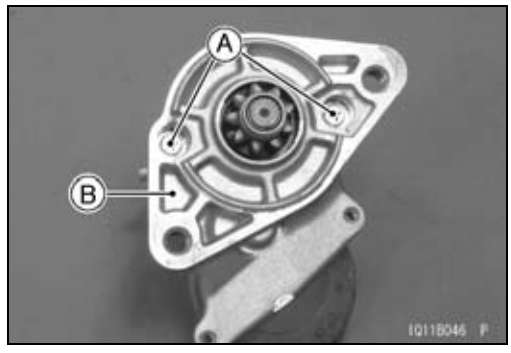
- Remove:
  End Cover Screws [A] and O-rings
  End Cover [B]



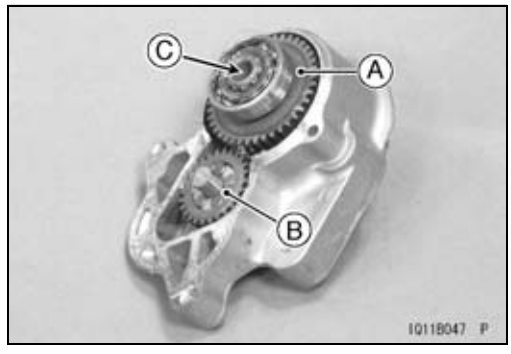
- Remove:
  Armature [A]
  Positive Brushes [B]
  Brush Plate [C]



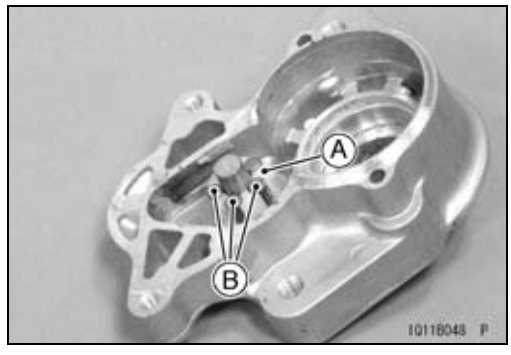
- Remove:
  Drive End Cover Screws [A]
  Drive End Cover [B]



- Remove:
  Starter Clutch [A]
  Idle Gear [B]
  Steel Ball [C]



- Remove:
  Retainer [A]
  Rollers [B]



Electric Starter System

● Remove the return spring [A].

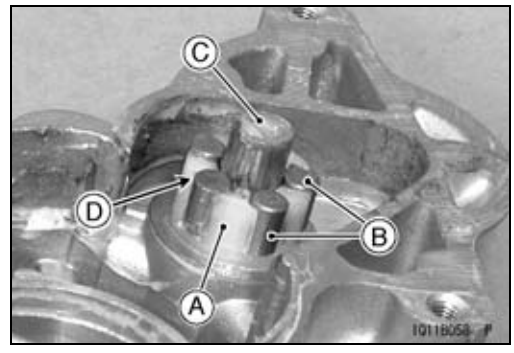


Starter Motor Assembly

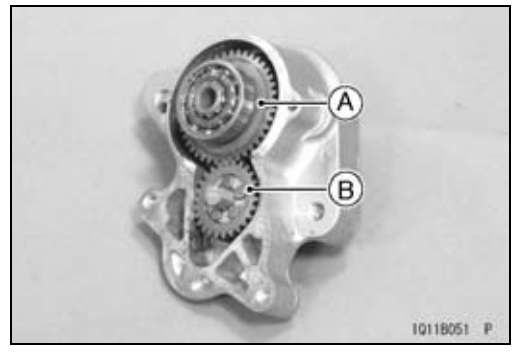
● Apply grease to the following parts.
Retainer and Rollers
Starter Clutch
Steel Ball
Return Spring
Armature Bearing

Grease - Denso No. 50 Grease or Equivalent (Esso Beacon 325)

● Install the retainer [A] and rollers [B] on the drive end cover shaft [C].
○Face the opening side [D] of the retainer to the magnetic switch assy.



● Install:
Starter Clutch [A]
Idle Gear [B]



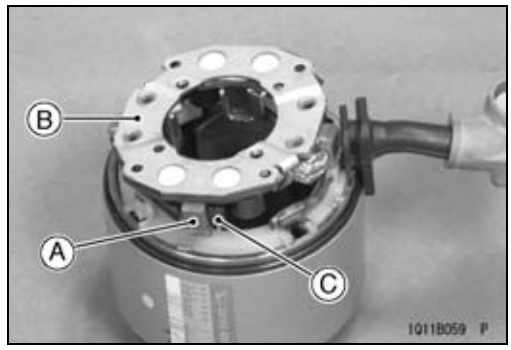
● Install:
Steel Ball
Return Spring
Drive End Cover and Screws

Electric Starter System

- Install the positive brushes [A] on the brush plate [B] with needle nose pliers.

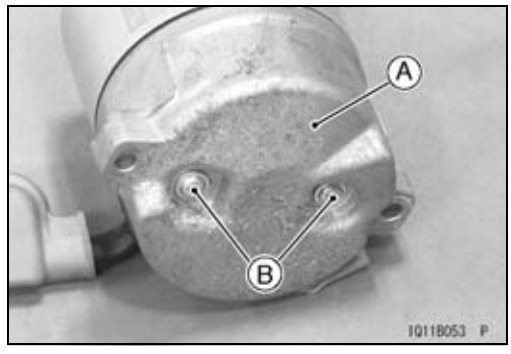
○Pull the springs [C] and brushes, and hold the brushes with the springs.

- Install the armature.



- Install:
  End Cover [A]
  End Cover Screws [B] and O-rings
- Tighten:

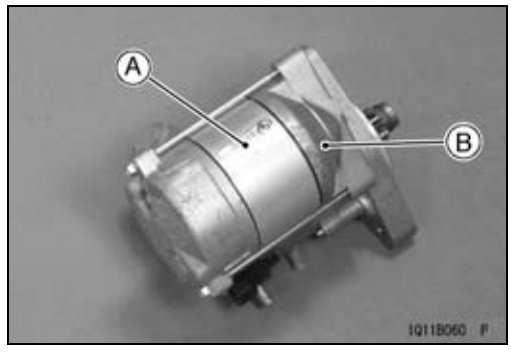
Torque - Starter Motor End Cover Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)



- Install the yoke [A] on the magnetic switch [B].
- Tighten:

Torque - Starter Motor Through Bolts: 9.3 N·m (0.95 kgf·m, 82 in·lb)

- Install the field coil cable and tighten the nut securely.



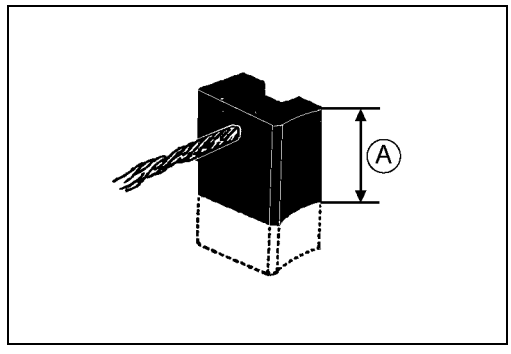
Carbon Brush Inspection

- Measure the carbon brush length [A].

★If the brush length is less than the service limit, replace the brush assembly.

Carbon Brush Length

Standard:	**15.5 mm (0.61 in.)**
Service Limit:	**11.0 mm (0.43 in.)**



Yoke Inspection

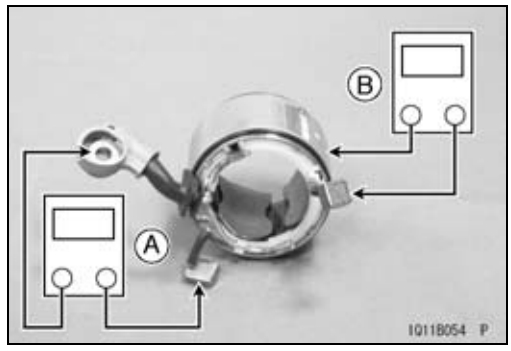
- Measure the resistance between the carbon brush and the wire terminal [A].

Special Tool - Hand Tester: 57001-1394

★If there is not close to 0 Ω, the field coils have an open. Replace the yoke.

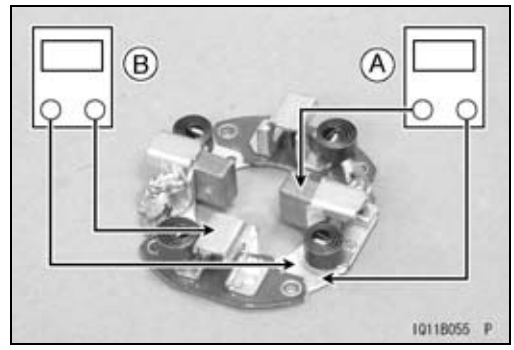
- Measure the resistance between the carbon brush and the yoke body [B].

★If there is any reading, the yoke has a short. Replace the yoke.



Electric Starter System

Brush Plate Inspection



- Measure the resistance between the carbon brush and the brush plate [A].

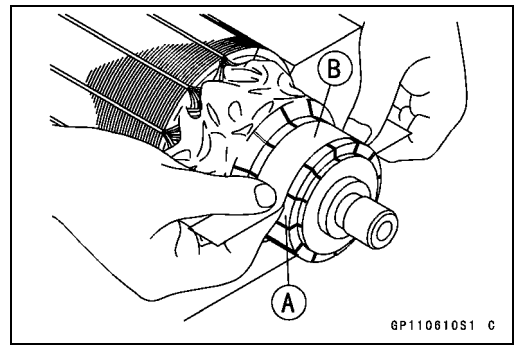
Special Tool - Hand Tester: 57001-1394

★If there is not close to 0 Ω, the brush plate has an open. Replace the brush plate.

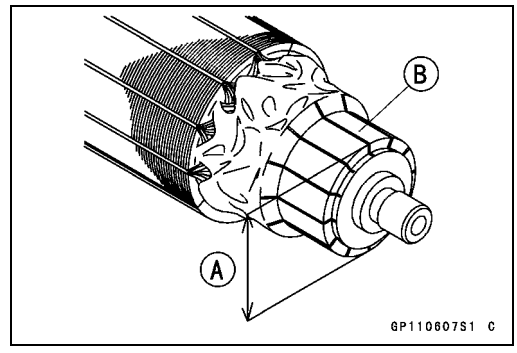
- Measure the resistance between the brush plate and the (+) brush holder [B].

★If there is any reading, the brush plate has a short. Replace the brush plate.

Commutator Cleaning/Inspection



- Smooth the commutator surface [A] if necessary with fine emery cloth [B], and clean out the grooves.



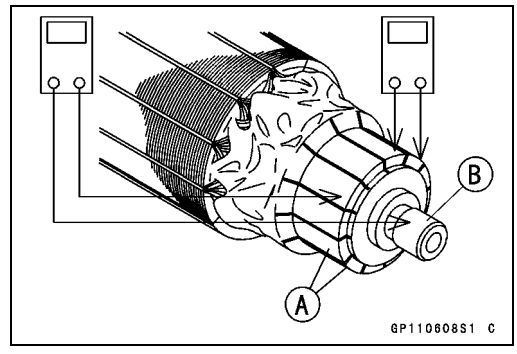
- Measure the diameter [A] of the commutator [B].

★Replace the starter motor with a new one if the commutator diameter is less than the service limit.

Commutator Diameter

Standard:	**30 mm (1.18 in.)**
Service Limit:	**29 mm (1.14 in.)**

Armature Inspection



- Using the × 1 Ω range of the hand tester, measure the resistance between any two commutator segments [A].

Special Tool - Hand Tester: 57001-1394

★If there is a high resistance or no reading (∞) between any two segments, a winding is open. Replace the starter motor.

- Using the highest range of the hand tester, measure the resistance between the segments and the shaft [B].

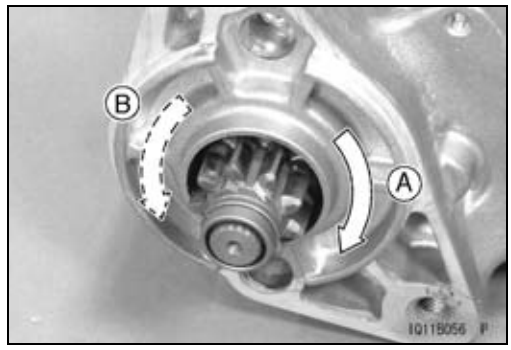
★If there is any reading at all, the armature has a short. Replace the starter motor.

NOTE

○*Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with the hand tester. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the starter motor with a new one.*

Electric Starter System

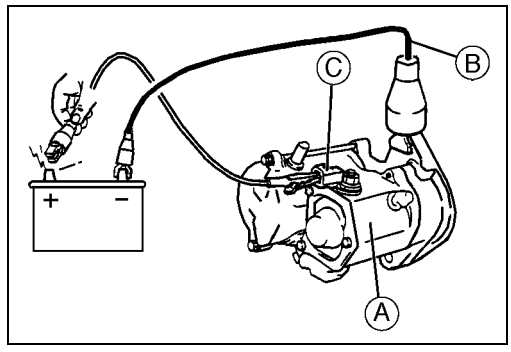
Pinion Gear Inspection



- Turn the pinion gear by hand. It should turn clockwise freely [A], but should not turn freely counterclockwise [B].

★If the pinion gear does not operate as it should or if there is any worn or damaged part, replace it.

Starter Switch Inspection



- Connect a 12 V battery to the starter switch [A] as shown in the figure.

○Connect the battery negative (–) cable [B] first and then the positive lead to the terminal in the connector [C].

★If the switch does not work as specified, the switch is defective. Replace the starter switch.

Testing Switch

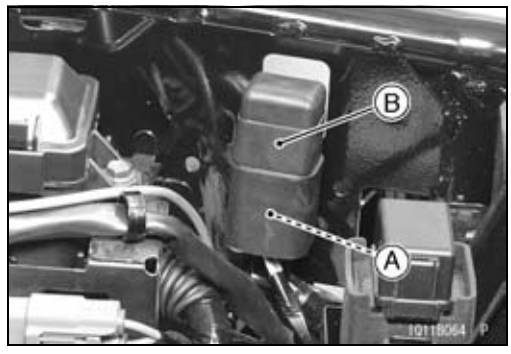
Criteria: When battery is connected →

Pinion gear must move outward quickly.

When battery is disconnected →

Pinion gear must return quickly.

Starter Circuit Relay Inspection



- Tilt up the seat.
- Remove:

Starter Circuit Relay Connector [A]

Starter Circuit Relay [B]

Electric Starter System

- Connect the hand tester [A] and 12 V battery [B] to the starter circuit relay [C] as shown in the figure.

Special Tool - Hand Tester: 57001-1394

★If the relay does not work as specified, the relay is defective. Replace the relay.

Testing Relay

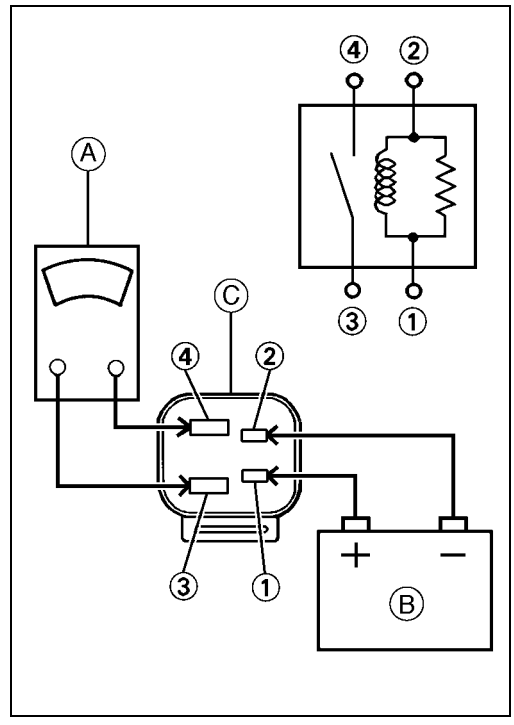
Hand Tester Range: × 1 Ω

Criteria: When battery is connected → 0 Ω

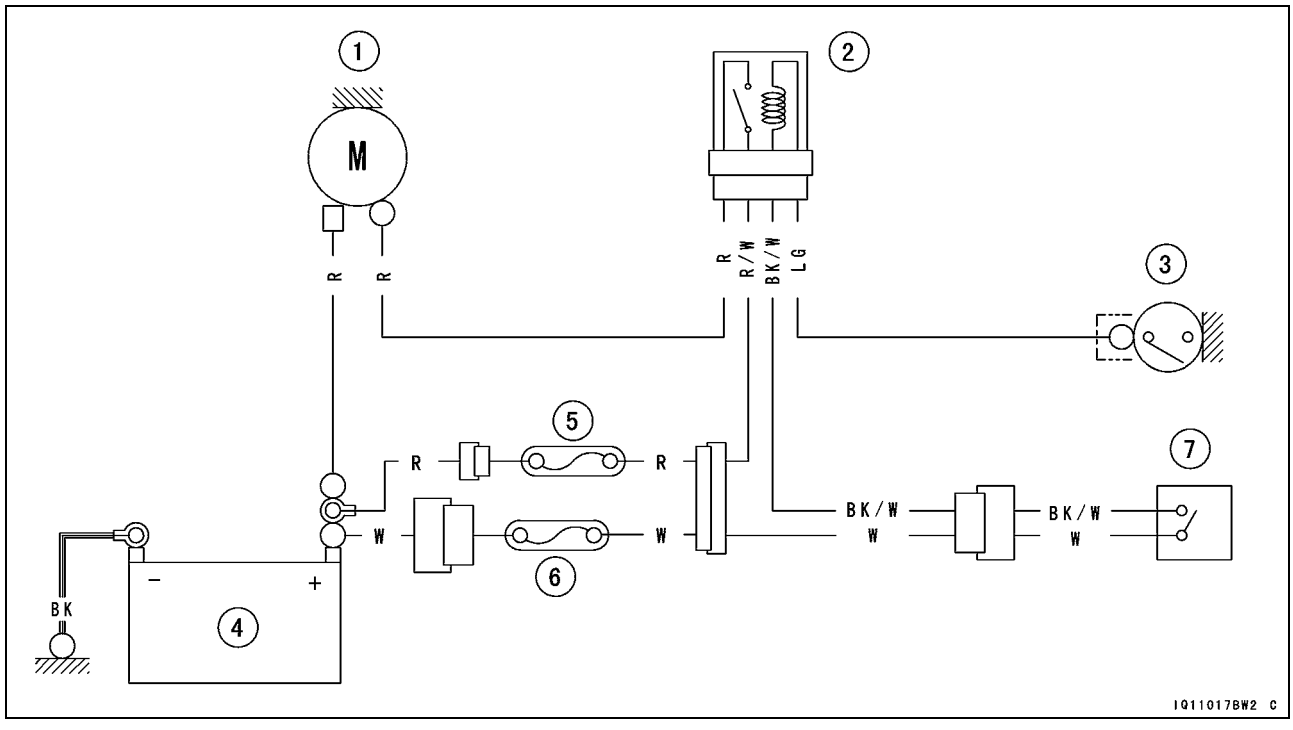
When battery is disconnected → ∞ Ω

Relay Coil Terminals [1] and [2]

Relay Switch Terminals [3] and [4]



Electric Starter Circuit

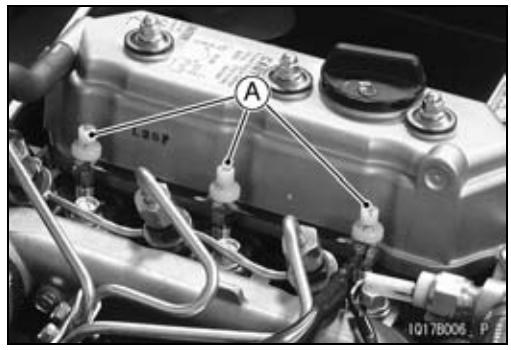


1. Starter Motor
2. Starter Circuit Relay
3. Neutral Switch
4. Battery
5. 30 A Fuse
6. 30 A Fuse
7. Main Switch

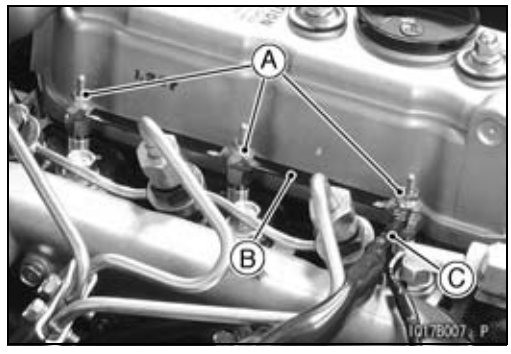
Preheating System

Glow Plug Removal

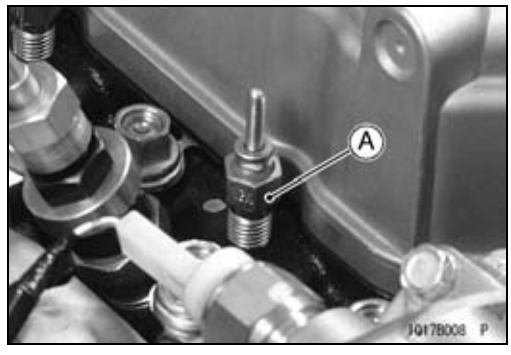
- Tilt up the cargo bed.
- Remove the caps [A].



- Remove:
  Connecting Plate Nuts [A]
  Connecting Plate [B]
  Glow Plug Lead [C]



- Remove the glow plug [A].



Glow Plug Installation

- Tighten:

Torque - Glow Plugs: 17 N·m (1.7 kgf·m, 13 ft·lb)
Connecting Plate Nuts: 1.2 N·m (0.12 kgf·m, 11 in·lb)

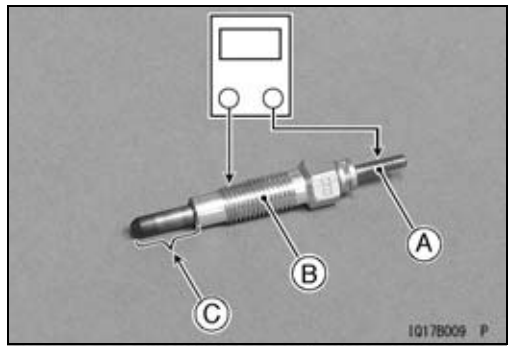
Glow Plug Inspection

- Using the × 1 Ω range of the hand tester, measure the resistance between the terminal [A] and the housing [B] of the glow plug.

Special Tool - Hand Tester: 57001-1394

★If the tester does not read as specified, replace the glow plug.

Glow Plug Resistance: About 0.1 ~ 5.0 Ω

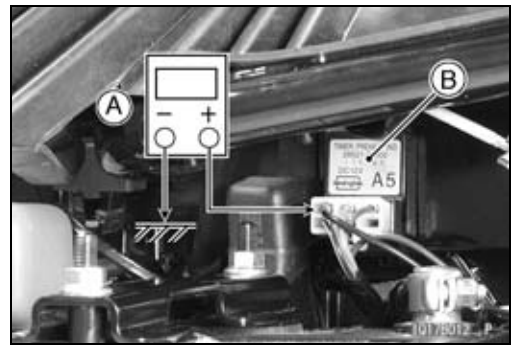


NOTE

○*Be careful not to apply the battery voltage to the glow plug directly.*
○*Be careful not to scratch the heater section [C].*

Preheating System

Preheating Timer Inspection



- Check that the main switch is turned OFF, and connect the hand tester [A] to the preheating timer [B] as follows.

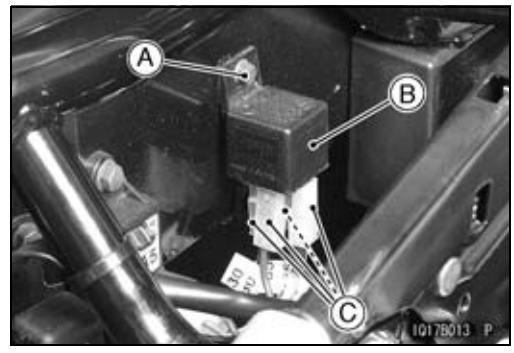
Special Tool - Hand Tester: 57001-1394

Hand Tester Range: DC 25 V
Hand Tester (+) Lead → Black Lead Terminal
Hand Tester (–) Lead → Ground

- When the main switch is turned ON, the reading should show less than 1.8 V during 5 seconds.

★If the preheating timer does not work, replace the timer.

Glow Plug Relay Inspection



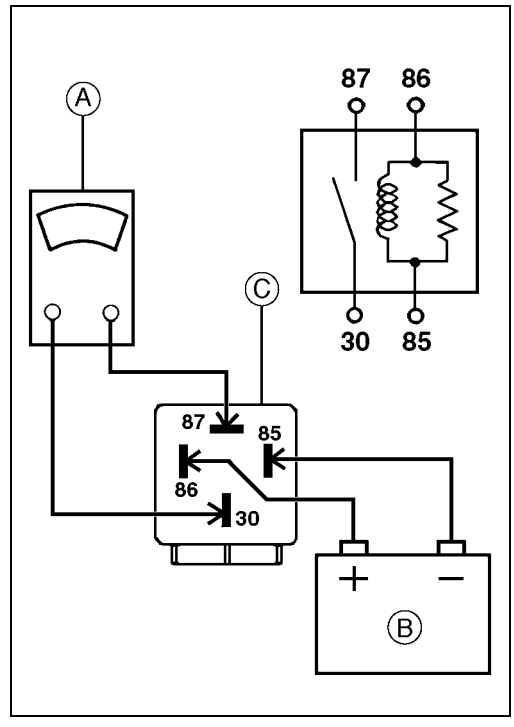
- Remove:
  Mounting Bolt [A] and Nut
  Glow Plug Relay [B]
  Glow Plug Relay Lead Connectors [C]

- Connect the hand tester [A] and 12 V battery [B] to the glow plug relay [C] as shown in the figure.

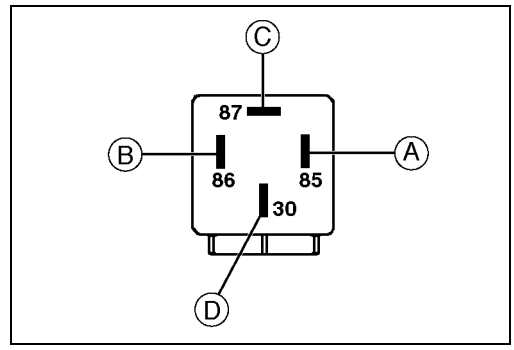
Special Tool - Hand Tester: 57001-1394

★If the relay does not work as specified, the relay is defective. Replace the relay.

Testing Relay
Hand Tester Range: × 1 Ω
Criteria: When battery is connected → 0 Ω
When battery is disconnected → ∞ Ω
Relay Coil Terminals [85] and [86]
Relay Switch Terminals [30] and [87]



Glow Plug Relay Installation

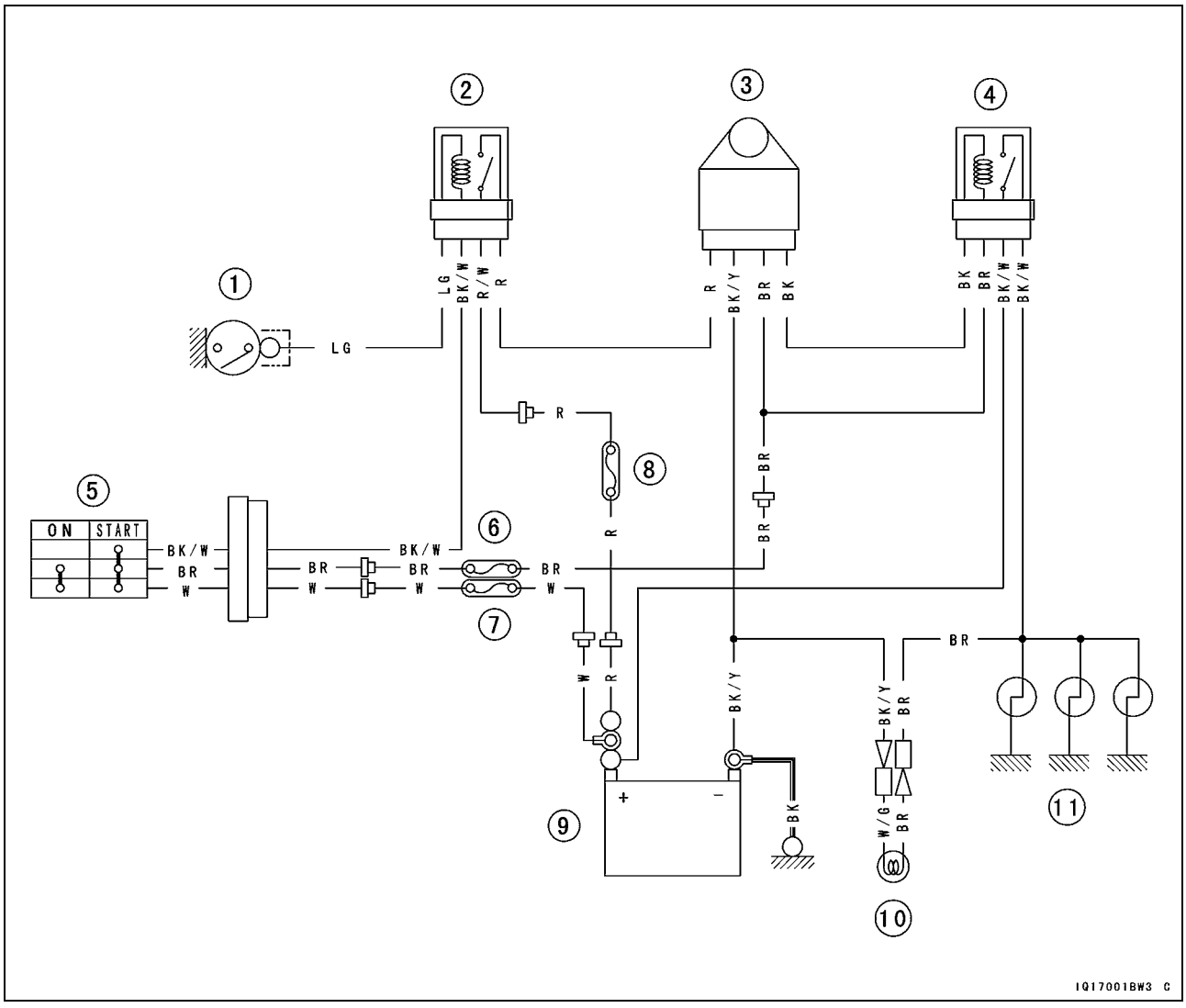


- Connect the leads to the glow plug relay terminals as follows.

Black Lead (Tag No. 85)	→	**to Terminal No. 85 [A]**
Brown Lead (Tag No. 86)	→	**to Terminal No. 86 [B]**
Black/White Lead (Tag No. 87)	→	**to Terminal No. 87 [C]**
Black/White Lead (Tag No. 30)	→	**to Terminal No. 30 [D]**

Preheating System

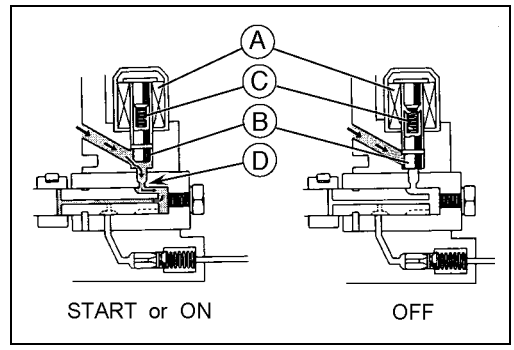
Preheating System Circuit



1. Neutral Switch
2. Starter Circuit Relay
3. Preheating Timer
4. Glow Plug Relay
5. Main Switch
6. 5 A Fuse
7. 30 A Fuse
8. 30 A Fuse
9. Battery
10. Glow Plug Light
11. Glow Plugs

Fuel Cut Solenoid

Fuel Cut Solenoid



The fuel cut solenoid [A] is in the fuel injection pump.

When the main switch is turned to the “START” position, the fuel solenoid is energized and the solenoid valve [B] lifts against the spring [C] and opens the fill port [D] to the pressure chamber.

When the switch is returned to the “ON” position, after the engine has started, the current flows through a resistor to the solenoid, reducing the current slightly but maintaining enough energy to hold the valve open.

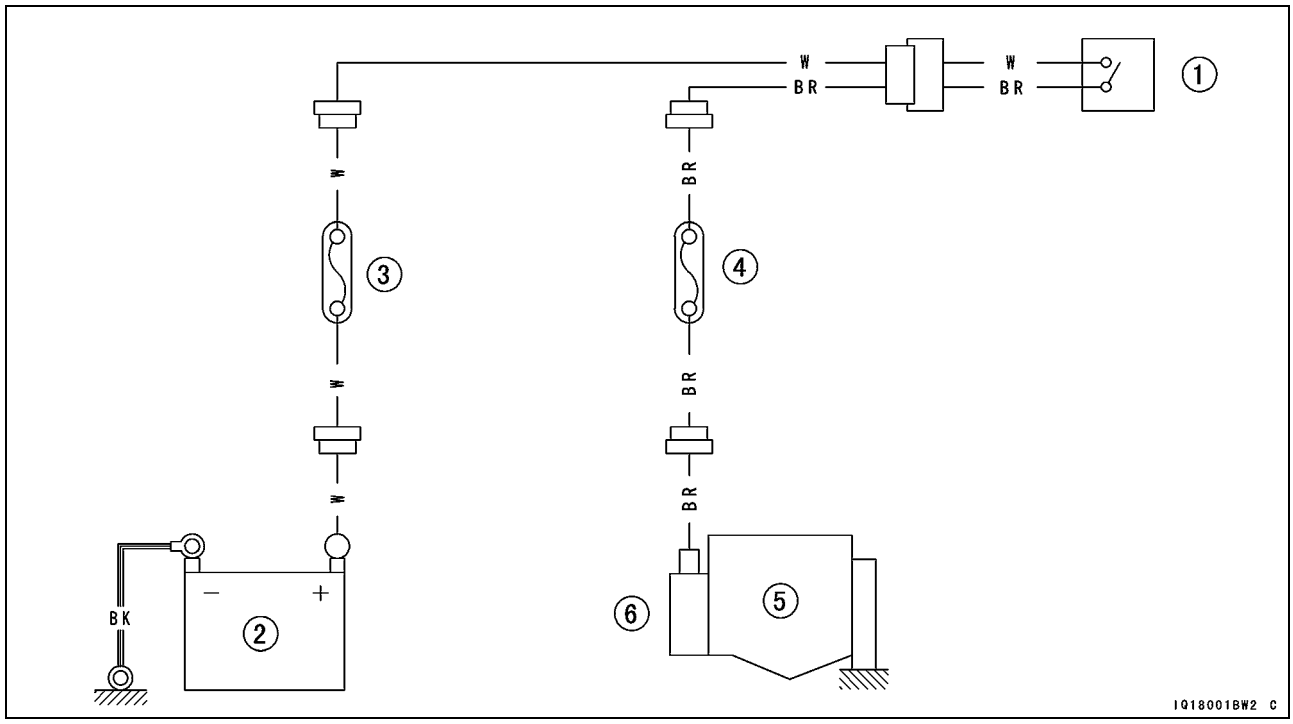
Turning the main switch to the “OFF” position shuts off the current to the solenoid. With no current to hold the valve, the spring forces the valve to close the fill port, thus shutting off the fuel supply and the engine.

Fuel Cut Solenoid Inspection

- When the main switch is turned ON, check that the fuel cut solenoid makes a clicking sound (operating sound).

★If the fuel injection pump does not click, replace it, or consult a reliable fuel injection pump repair shop (ex. Denso Service Station).

Fuel Cut Solenoid Circuit



1. Main Switch
2. Battery
3. 30 A Fuse
4. 5 A Fuse
5. Fuel Injection Pump
6. Fuel Cut Solenoid

Radiator Fan

Radiator Fan Circuit Inspection

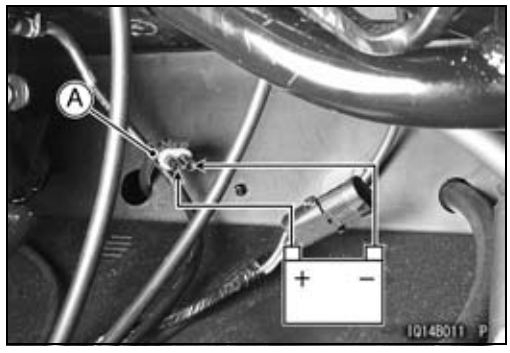


- Remove the front cargo hood (see Front Cargo Hood Removal in the Frame chapter).
- Disconnect the leads from the radiator fan switch.
- Using an auxiliary lead [A], connect the radiator fan switch leads.

★If the radiator fan rotates, inspect the radiator fan switch.

★If the radiator fan does not rotate, inspect the following.
Wiring and Connectors
Radiator Fan Breaker (see Radiator Fan Breaker Inspection)
30 A Fan Fuse (see Fuse Inspection)
Radiator Fan Motor (see Radiator Fan Motor Inspection)
Radiator Fan Relay (see Radiator Fan Relay Inspection)

Radiator Fan Motor Inspection



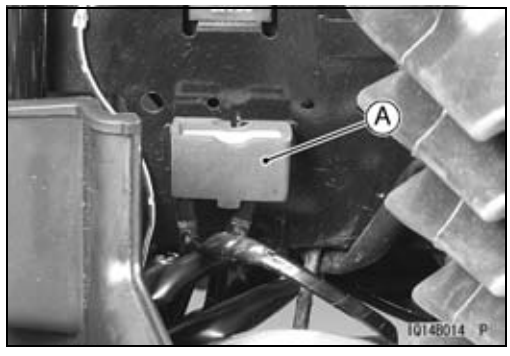
- Disconnect the fan motor lead connector [A] from the harness.
- Using two auxiliary leads, supply battery power to the fan motor.

★If the fan does not rotate at this time, the fan motor is defective and must be replaced.

Radiator Fan Motor Leads

Red	**:**	**Battery (+)**
Black	**:**	**Battery (–)**

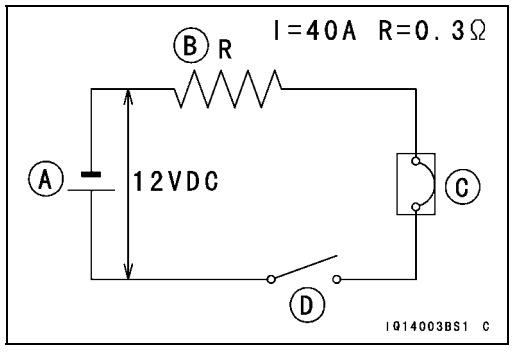
Radiator Fan Breaker Inspection



- Tilt up the front seat.
- Remove:
Battery Cables (see Battery Removal)
Radiator Fan Breaker [A]

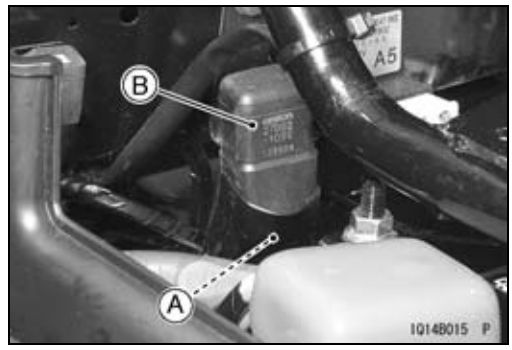
- Inspect the breaker for operation.
- Connect:
12 V Battery [A]
0.3 Ω Resistance [B]
Radiator Fan Breaker [C]
Switch [D]

★If the circuit in the breaker will not open within 60 seconds, replace the breaker.



Radiator Fan

Radiator Fan Relay Inspection



- Remove:
  Radiator Fan Relay Lead Connector [A]
  Radiator Fan Relay [B]

- Connect the hand tester [A] and 12 V battery [B] to the radiator fan relay [C] as shown in the figure.

Special Tool - Hand Tester: 57001-1394

★If the relay does not work as specified, the relay is defective. Replace the relay.

Testing Relay

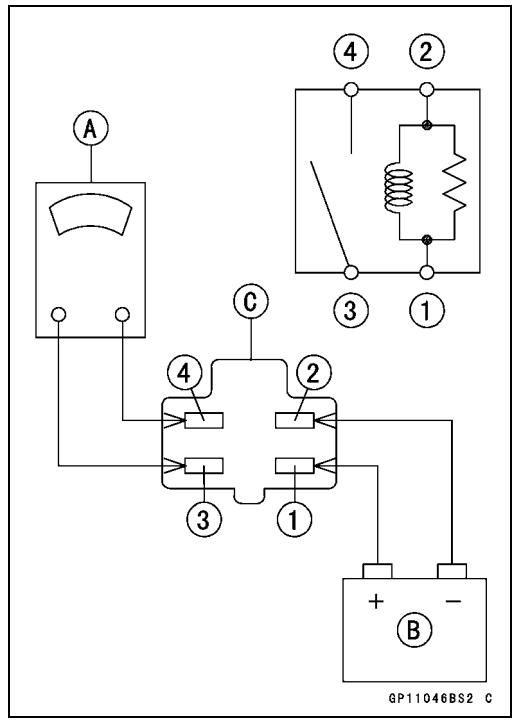
Hand Tester Range: × 1 Ω

Criteria: When battery is connected → 0 Ω

When battery is disconnected → ∞ Ω

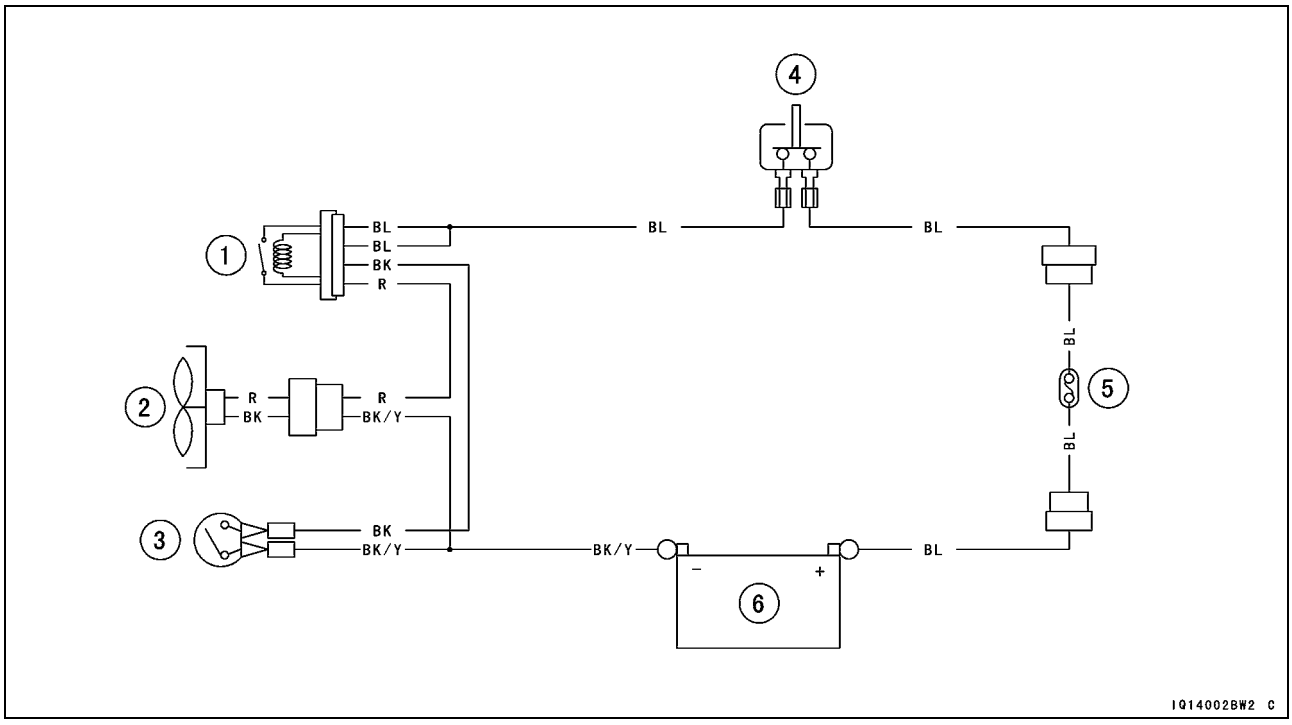
Relay Coil Terminals [1] and [2]

Relay Switch Terminals [3] and [4]



Radiator Fan

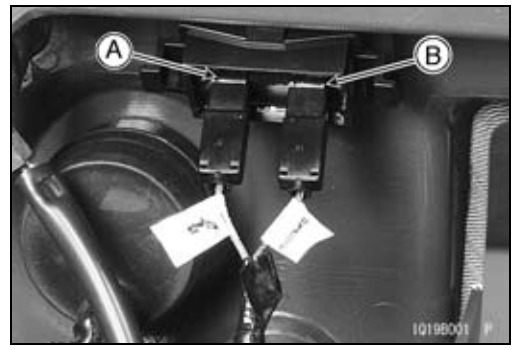
Radiator Fan Circuit



1. Radiator Fan Relay
2. Radiator Fan
3. Radiator Fan Switch
4. Radiator Fan Breaker
5. 30 A Fuse
6. Battery

Meter

Hour Meter Installation



- Connect the lead connectors to the hour meter terminals as follows.

Blue/Red Lead (Tag +) → to Terminal (+) [A]
Black/Yellow Lead (Tag –) → to Terminal (–) [B]

Lighting System

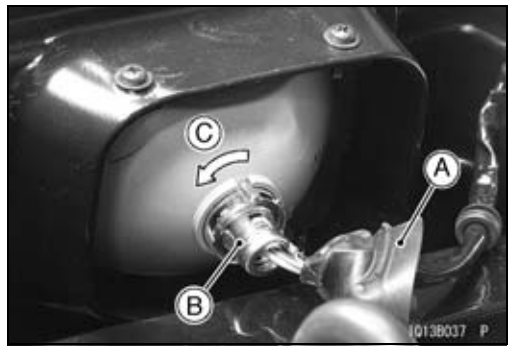
Headlight Beam Adjustment

- Turn the adjusting screw [A] on each headlight rim in or out to adjust the headlight vertically.



Headlight Bulb Replacement

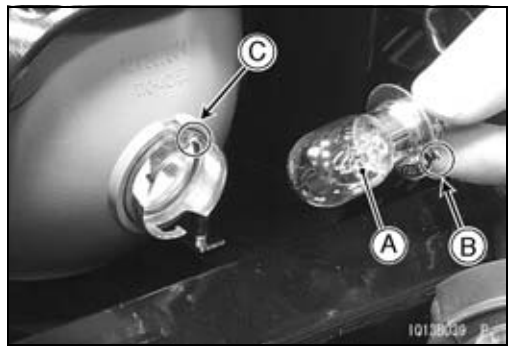
- Remove:
  Front Cargo Compartment (see Front Cargo Compartment Removal in the Frame chapter)
  Dust Cover [A]
- Turn the bulb holder [B] counterclockwise [C] and remove it.



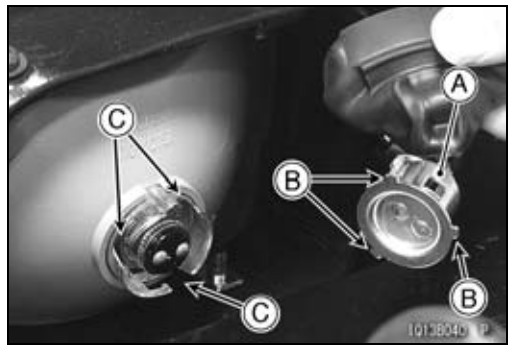
- Remove the headlight bulb [A].



- Insert the new bulb [A] by aligning the tang [B] with the notch [C] in the headlight unit.



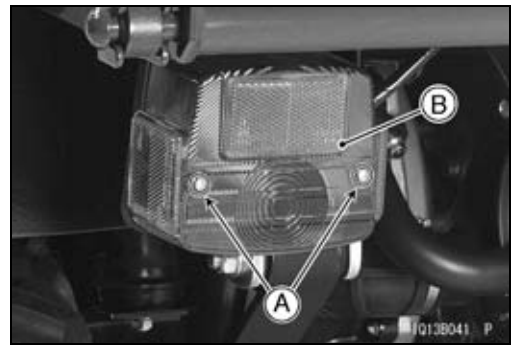
- Insert the bulb holder [A] by aligning the tangs [B] with the notches [C] in the headlight unit.
- Push the holder and turn it clockwise. It should lock in the position.
- Fit the dust cover completely.



Lighting System

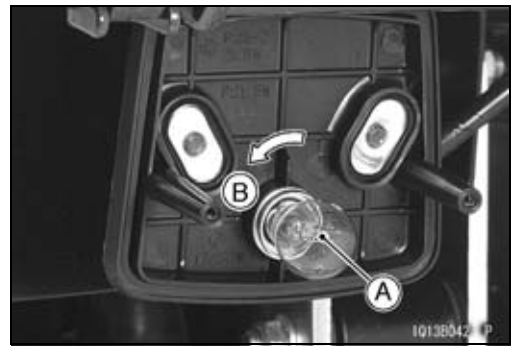
Tail/Brake Light Replacement

- Remove:
  Screws [A]
  Tail/Brake Light Lens [B]



- Push and turn the bulb [A] counterclockwise [B] and remove it.

CAUTION
Do not use bulbs rated for greater wattage than the specified value.

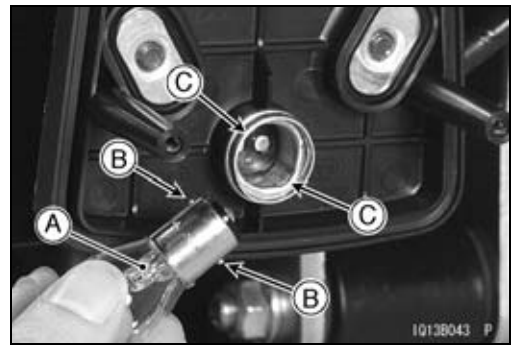


- Insert the new bulb [A] by aligning its upper and lower pins [B] with the upper and lower grooves [C] in the socket, and turn the bulb clockwise.

○Turn the bulb about 15°.

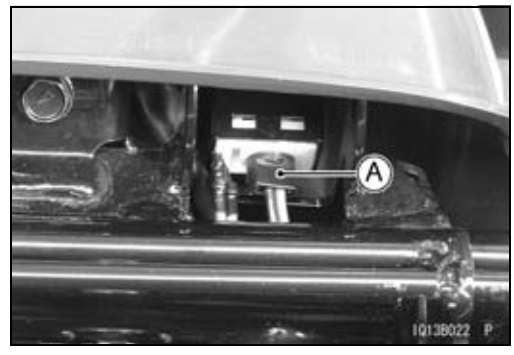
- Install the tail/brake light lens.

○Be careful not to overtighten the lens mounting screws.



Light Switch Bulb Replacement

- Remove the front cargo compartment (see Front Cargo Compartment Removal in the Frame chapter).
- Turn the socket [A] counterclockwise, and pull it with the bulb.



- Pull the bulb [A] out of the socket.

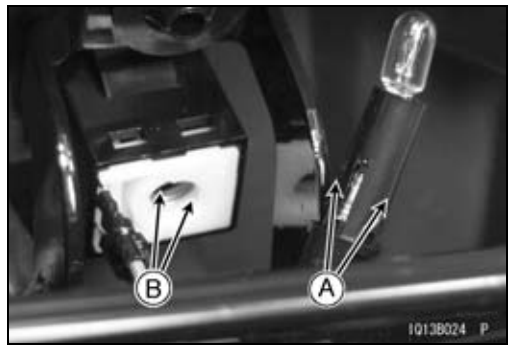
CAUTION
Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. **Do not use bulb rated for greater wattage than the specified value.**



- Insert the new bulb in the socket.

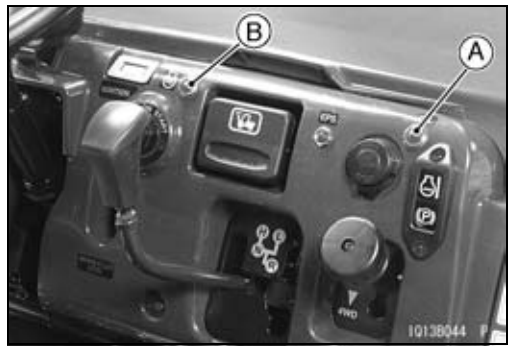
Lighting System

- Align the projections [A] of the socket with the recesses [B] in the switch body, and turn the socket clockwise.

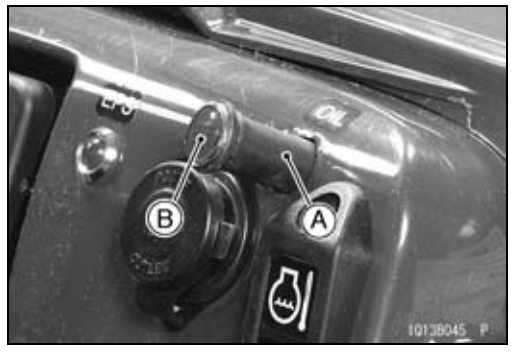


Indicator Light Bulb Replacement

Oil Pressure Warning Indicator Light [A]
Glow Plug Light [B]



- Remove:
  Light Assembly [A]
  Lens [B]



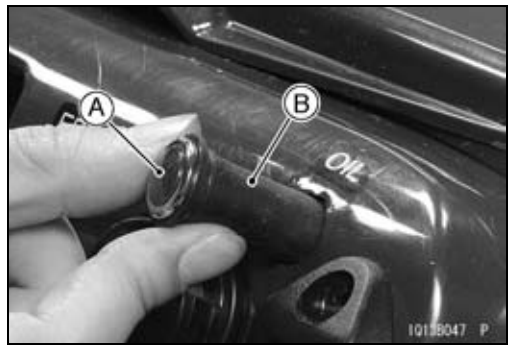
- Roll the rubber [A] up and pull the bulb [B] out of the socket.

CAUTION

Do not turn the bulb. Pull the bulb out to prevent damage to the bulb.
Do not use bulb rated for greater wattage than the specified value.

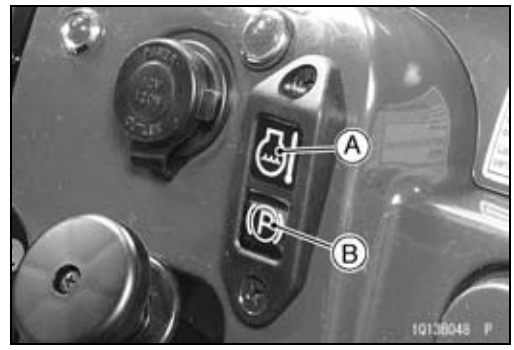


- Install:
  New Bulb
  Lens [A]
  Light Assembly [B]

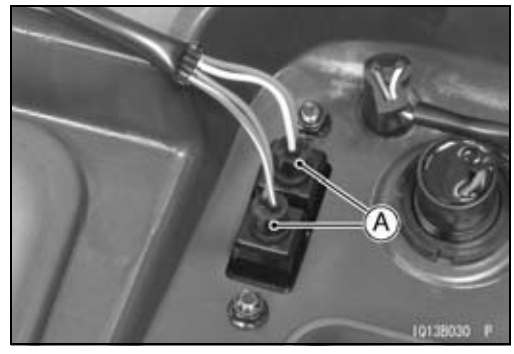


Lighting System

Coolant Temperature Warning Indicator Light [A]
Parking Brake Indicator Light [B]



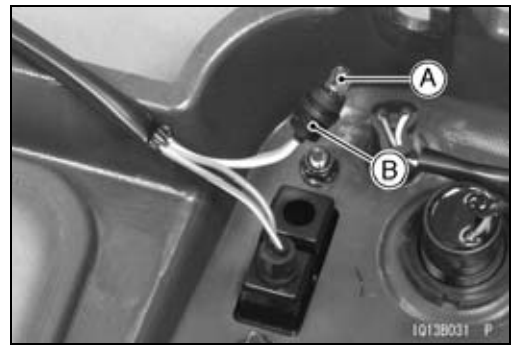
- Remove:
  Control Panel (see Control Panel Removal in the Frame chapter)
  Sockets [A]



- Pull the bulb [A] out of the socket [B].

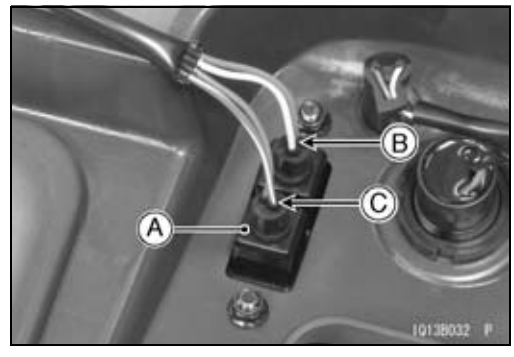
CAUTION

Do not turn the bulb. Pull the bulb out to prevent damage to the bulb.
Do not use bulb rated for greater wattage than the specified value.



- Insert the new bulb in the socket.

- Install the socket into the indicator light case [A].
  Brown and Light Green Lead [B] → Upper Case
  Brown and Red/White Lead [C] → Lower Case



Speedometer Illumination Bulb Replacement

- Pull the socket [A] with the bulb from the speedometer.



Lighting System

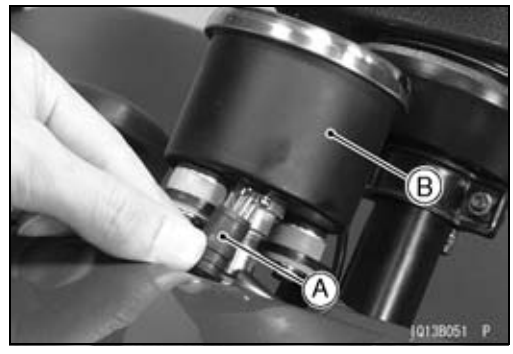
● Pull the bulb [A] out of the socket [B].

CAUTION

Do not turn the bulb. Pull the bulb out to prevent damage to the bulb.
Do not use bulb rated for greater wattage than the specified value.

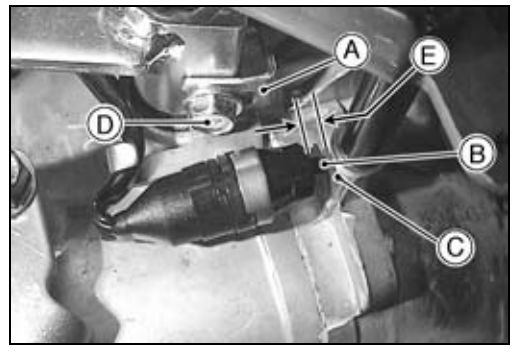


● Insert the new bulb in the socket [A].
● Install the socket into the speedometer [B].



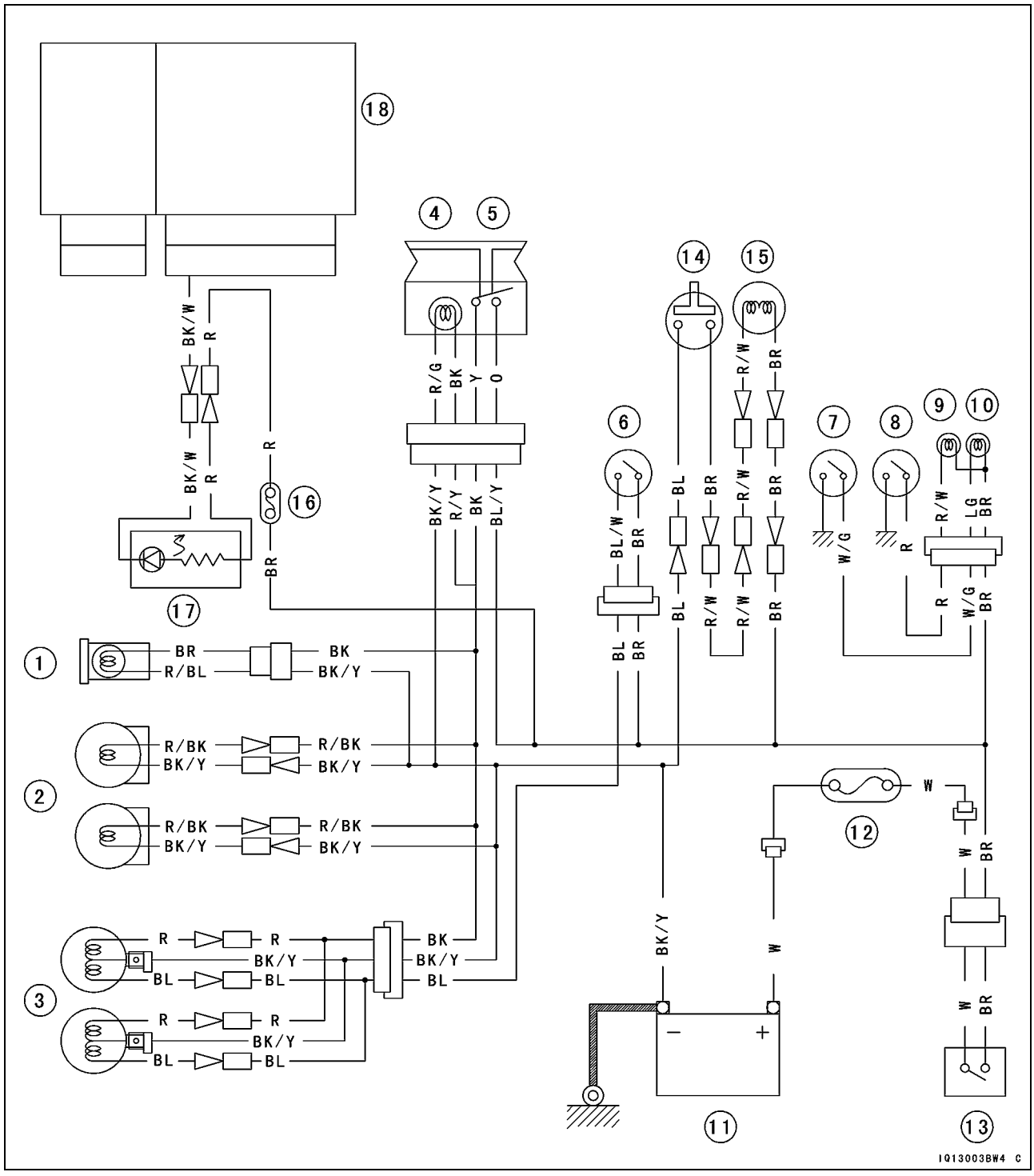
Reverse Light Switch Installation (Europe Model)

● Put the transmission shift lever in the REVERSE position.
● Install the reverse light switch bracket [A] on the reverse shift lever so that the switch rod [B] contacts the boss [C] and the clearance is 1 ~ 2 mm (0.04 ~ 0.08 in.) [E].
● Tighten the shift shaft lever clamp bolt [D] securely.



Lighting System

Lighting System Circuit



1. Speedometer Illumination
2. Headlights
3. Tail/Brake Lights
4. Light Switch Indicator Light
5. Light Switch
6. Brake Light Switch
7. Coolant Temperature Switch
8. Parking Brake Light Switch
9. Parking Brake Indicator Light
10. Coolant Temperature Warning Indicator Light
11. Battery
12. 30 A Fuse
13. Main Switch
14. Reverse Light Switch (Europe Model)
15. Reverse Light (Europe Model)
16. 7.5 A Fuse
17. EPS Warning Indicator Light (LED)
18. EPS ECU

Switches and Sensors

Brake Light Switch Inspection

- Refer to the Brake Light Switch Inspection in the Periodic Maintenance chapter.

Radiator Fan Switch Inspection

- Remove the radiator fan switch (see Radiator Fan Switch Removal in the Cooling System chapter).
- Suspend the fan switch [A] in a container of coolant so that the temperature sensing projection and threaded portion are submerged.
- Suspend an accurate thermometer [B] in the coolant, so that the sensitive portions [C] are located in almost the same depth.

NOTE

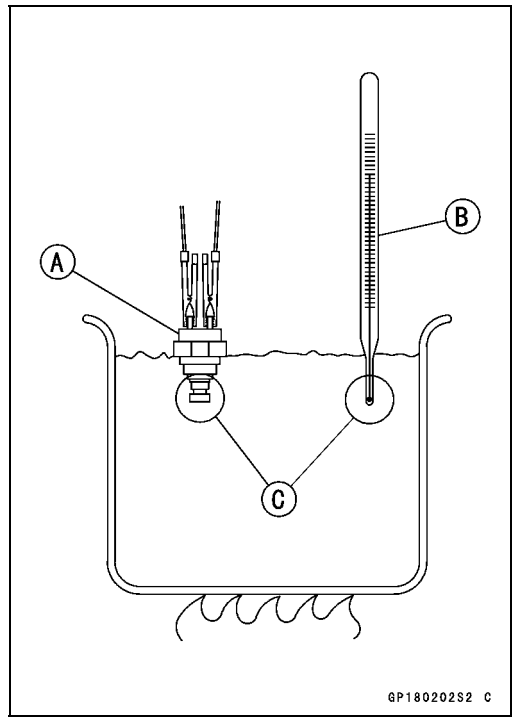
○*The switch and thermometer must not touch the container sides or bottom.*

- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the switch across the terminals at the temperatures shown in the table.

Special Tool - Hand Tester: 57001-1394

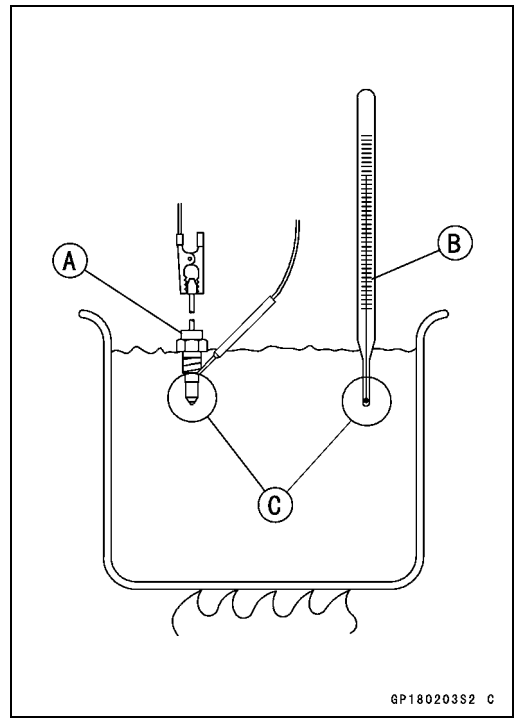
★If the hand tester does not show the specified values, replace the switch.

Radiator Fan Switch Resistance
Rising Temperature:
From OFF to ON at 86 ~ 90°C (187 ~ 194°F)
Falling Temperature:
From ON to OFF at 81 ~ 85°C (178 ~ 185°F)
ON: Less than 0.5 Ω
OFF: More than 1 MΩ



Switches and Sensors

Coolant Temperature Switch Inspection



- Remove the coolant temperature switch (see Coolant Temperature Switch Removal in the Cooling System chapter).
- Suspend the switch [A] in a container of coolant so that the temperature sensing projection and threaded portion are submerged.
- Suspend an accurate thermometer [B] in the coolant, so that the sensitive portions [C] are located in almost in the same depth.

NOTE

○*The switch and thermometer must not touch the container sides or bottom.*

- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the switch across the connector and the body at the temperatures shown in the table.

Special Tool - Hand Tester: 57001-1394

★If the hand tester does not show the specified values, replace the switch.

Coolant Temperature Switch Resistance
Rising Temperature:
From OFF to ON at 112 ~ 118°C (234 ~ 244°F)
Falling Temperature:
From ON to OFF within 10°C (50°F)
of "ON" temperature
ON: Less than 0.5 Ω
OFF: More than 1 MΩ

Switches and Sensors

Switch Inspection

- Using a hand tester, check to see that only the connections shown in the table have continuity (about zero ohms).

Special Tool - Hand Tester: 57001-1394

○For the main switch, light switch, brake light switch, parking brake light switch, and neutral switch, refer to the tables in the Wiring Diagram.

★If the switch has an open or short, repair it or replace it with a new one.

Horn Switch Connections

	BK	Ground
Push	○	○
Released		

Oil Pressure Switch Connections*

	BL/R	Ground
When engine is stopped	○	○
When engine is running		

*: Engine lubrication system is in good condition.

Reverse Light Switch Connections (Europe Model)

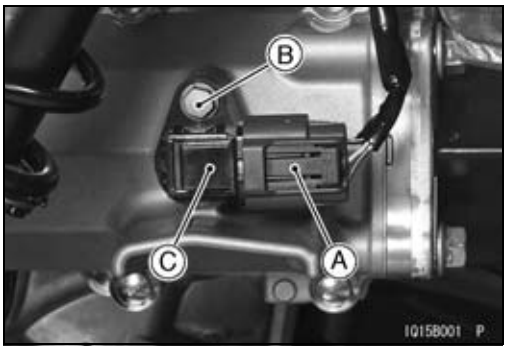
	BR	BL
When transmission is in reverse	○	○
When transmission is not in reverse		

Speed Sensor Removal

CAUTION

Never drop the speed sensor, especially on a hard surface. Such a shock to the sensor can damage it.

- Drain the transmission oil (see Transmission Oil Change in the Periodic Maintenance chapter).
- Disconnect the speed sensor lead connector [A].
- Remove:
  Bolt [B]
  Speed Sensor [C]

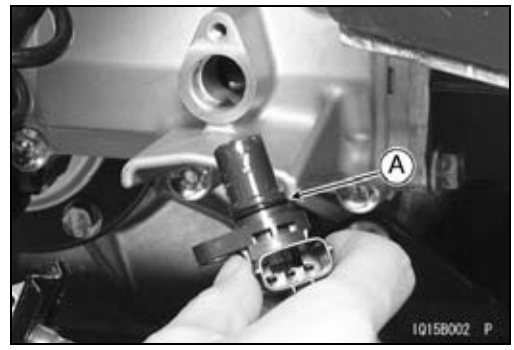


Switches and Sensors

Speed Sensor Installation

- Replace the O-ring [A] with a new one.
- Apply transmission oil to the O-ring.
- Tighten

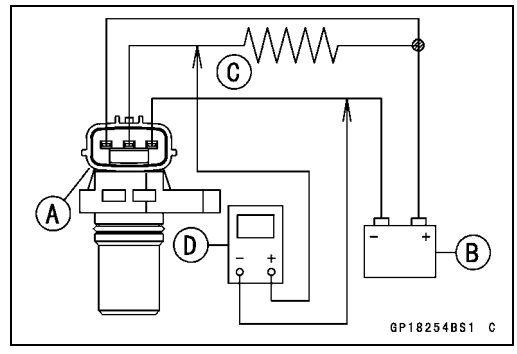
Torque - Speed Senor Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)



Speed Sensor Inspection

- Remove the speed sensor (see Speed Sensor Removal).
- Connect the speed sensor connector [A] with the battery [B], 10 kΩ resistor [C] and hand tester [D] as shown in the figure.
- Set the tester to the DC 25 V range.

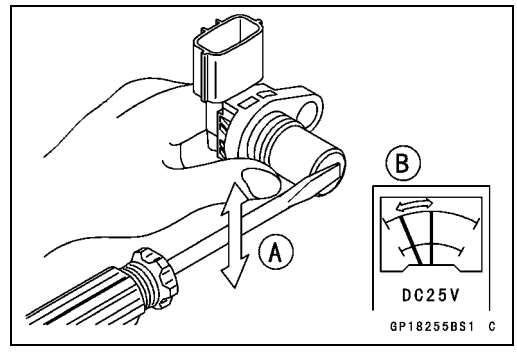
Special Tool - Hand Tester: 57001-1394



- Trace [A] each side of the speed sensor surface with the screwdriver.

○Then the tester indicator should flick [B].

★If the tester indicator does not flick, replace the speed sensor.

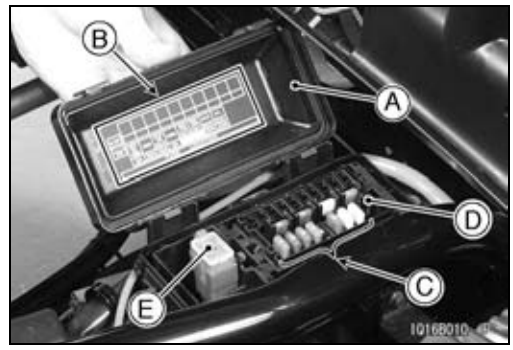


Fuses

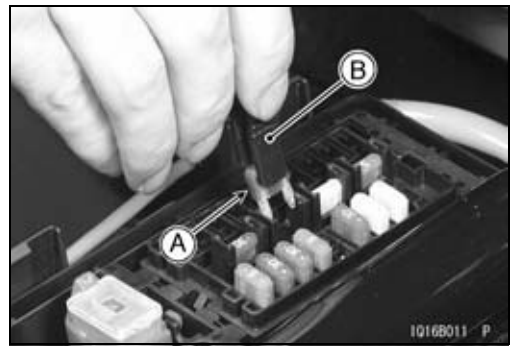
Fuse Removal

- Tilt up the seat.
- Unlock the hook to lift up the lid [A].

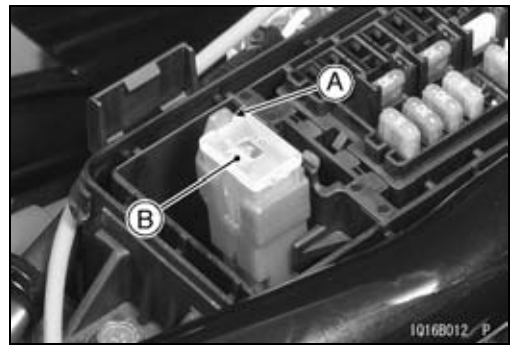
Fuse Location [B]
Fuses [C]
Fuse Remover [D]
50 A Fuse [E]



- Pull the fuse [A] straight out of the fuse box with the fuse remover [B].



- Unlock the stopper [A] and pull the 50 A fuse [B] straight out of the fuse box.



Fuse Installation

★If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of proper amperage.

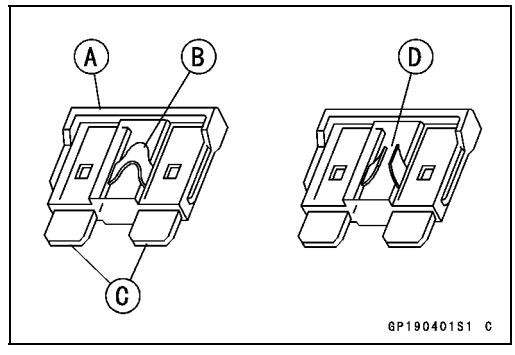
- Install the fuse box fuses on the original position as specified on the lid.

Fuse Inspection

- Remove the fuse (see Fuse Removal).
- Inspect the fuse element.

○For 50 A fuse, there is window for inspection in the upper surface.

★If it is blown out, replace the fuse. Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.



Housing [A]
Fuse Element [B]
Terminals [C]
Blown Element [D]

CAUTION

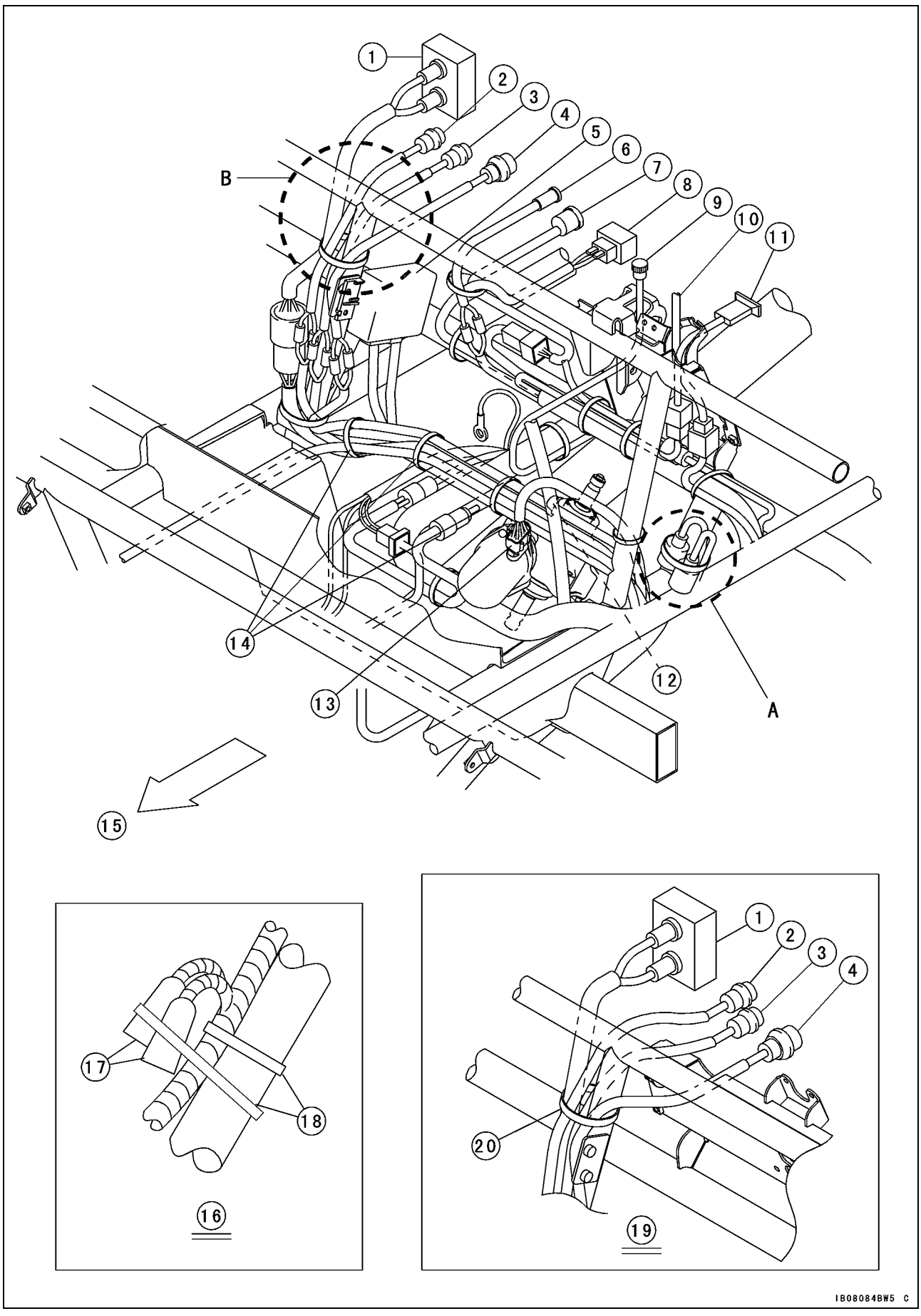
When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.

Appendix

Table of Contents

Cable, Wire, and Hose Routing 18-2
Troubleshooting Guide 18-24

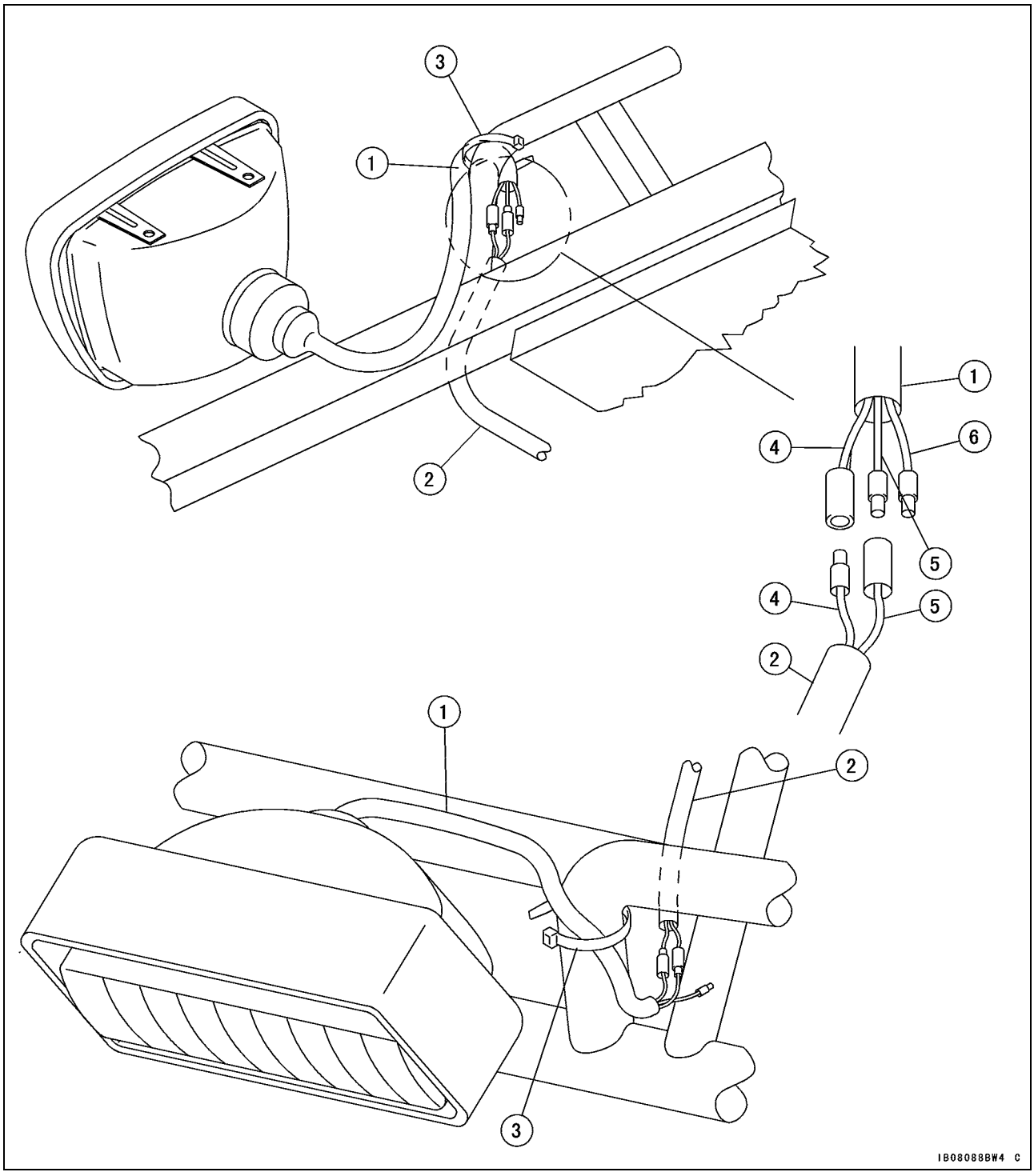
Cable, Wire, and Hose Routing



Cable, Wire, and Hose Routing

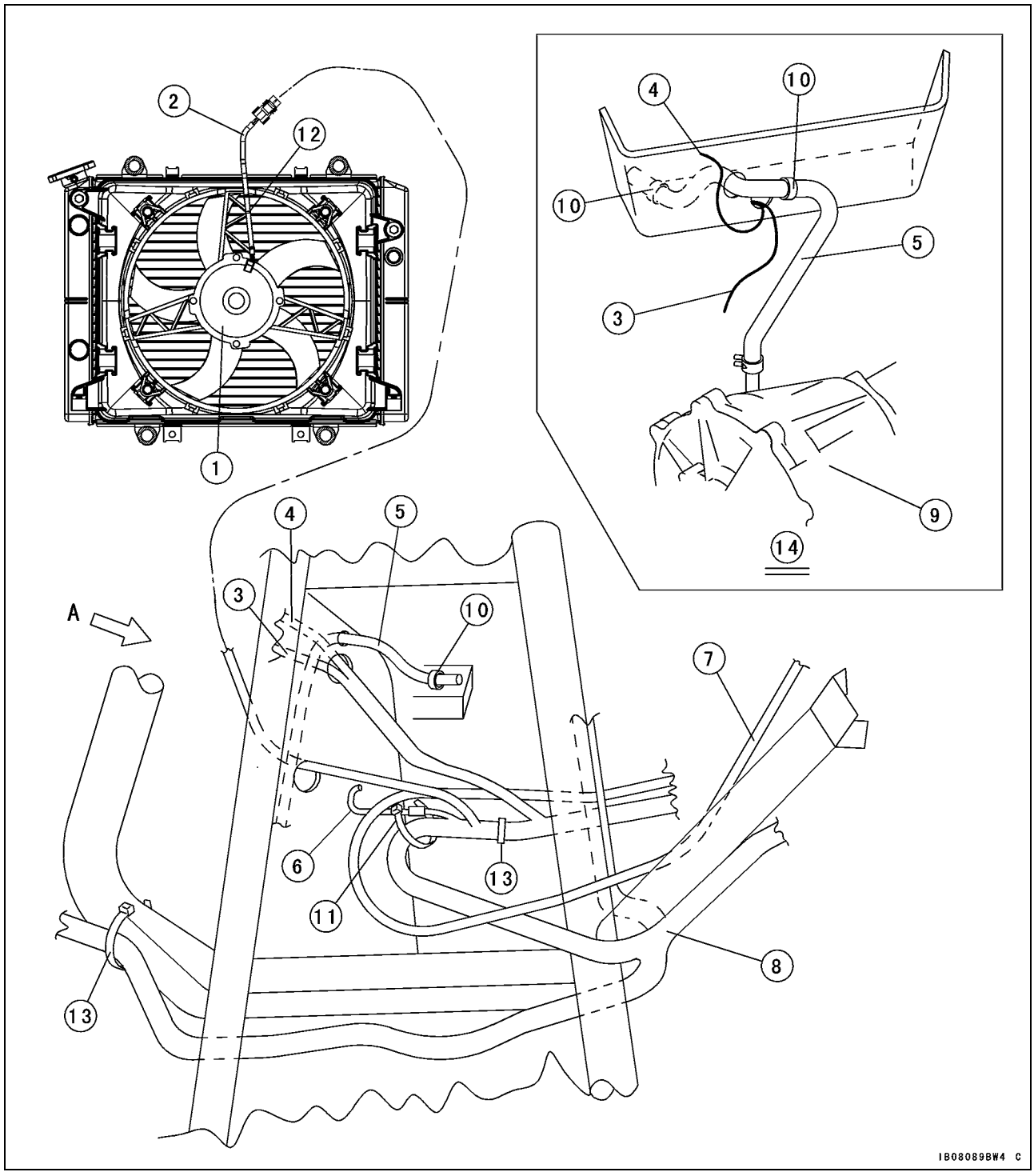
1. Parking Brake Indicator/Coolant Temperature Warning Indicator Lights
2. Oil Pressure Warning Indicator Light
3. Accessory Terminal
4. EPS Warning Indicator Light (LED)
5. EPS ECU
6. Glow Plug Light
7. Main Switch
8. Hour Meter
9. Speedometer Cable
10. Speedometer Illumination
11. Light Switch
12. EPS Torque Sensor Connector
13. EPS Motor Connector
14. Band (To prevent the damage of the brake hose, the cutting edge of the band faces down.)
15. Front
16. Detail A
17. Accessory Terminals
18. Band
19. Detail B
20. Band

Cable, Wire, and Hose Routing



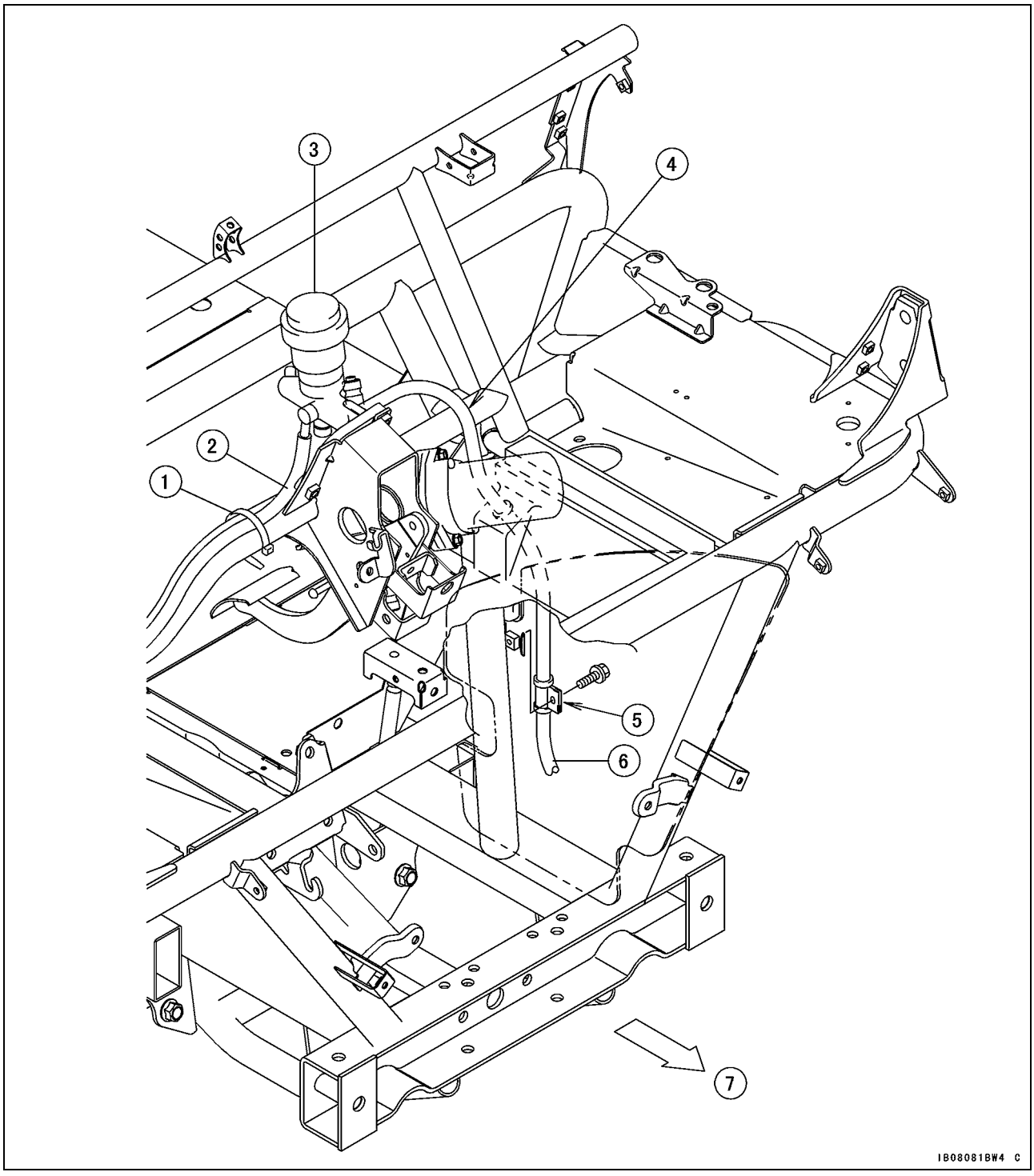
1. Headlight Lead
2. Main Harness
3. Band (Do not tighten band on lead connector joint.)
4. Black/Yellow Lead
5. Red/Black Lead
6. Red/Yellow Lead

Cable, Wire, and Hose Routing



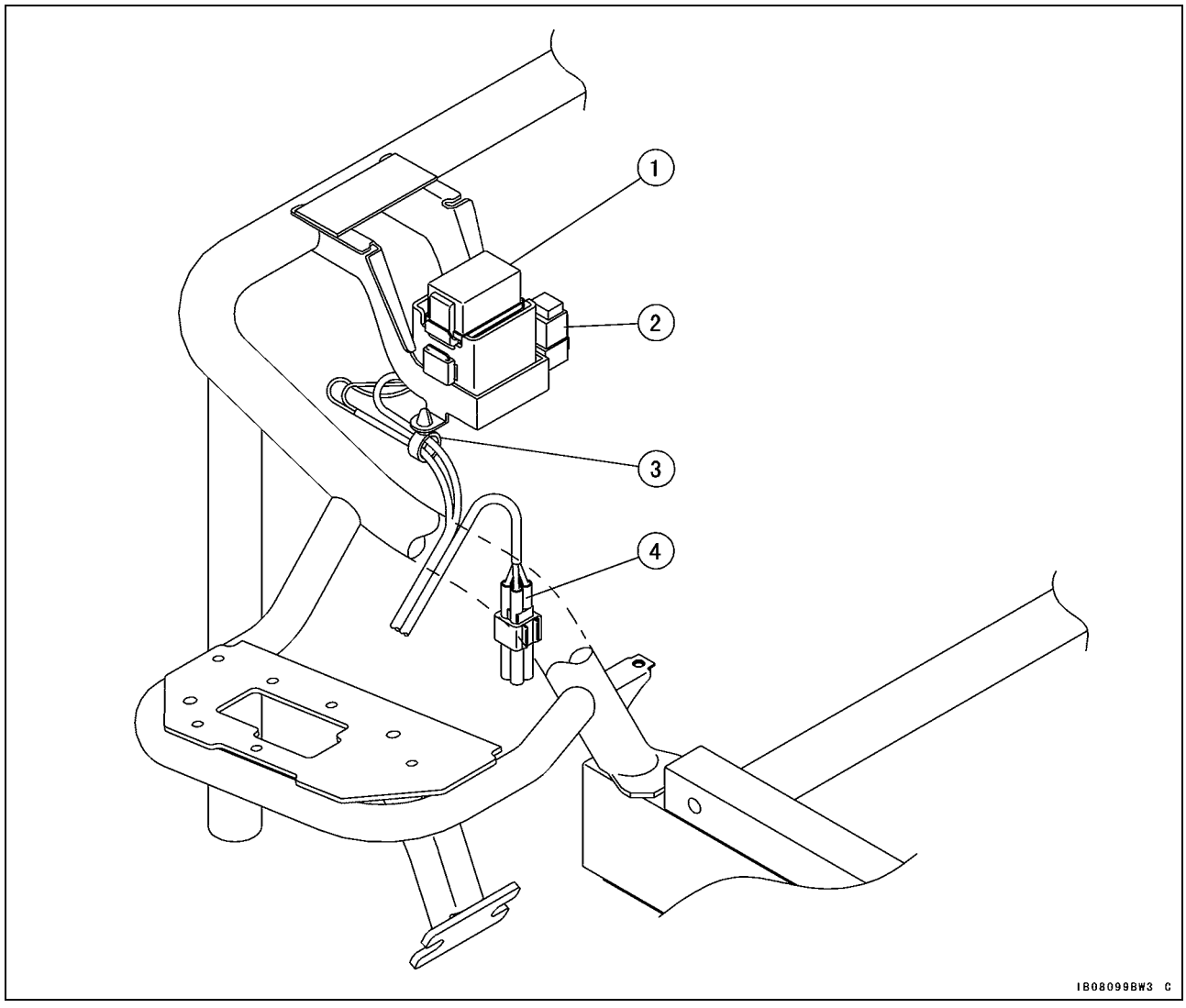
1. Radiator Fan Motor
2. Radiator Fan Motor Lead
3. Radiator Fan Switch Lead
4. Horn Lead
5. Front Final Gear Case Vent Hose
6. Brake Light Switch Lead
7. Speedometer Cable
8. Main Harness
9. Front Final Gear Case
10. Clamp
11. Clamp
12. The band must be located in exact position as shown in the figure.
13. Band
14. View from A

Cable, Wire, and Hose Routing



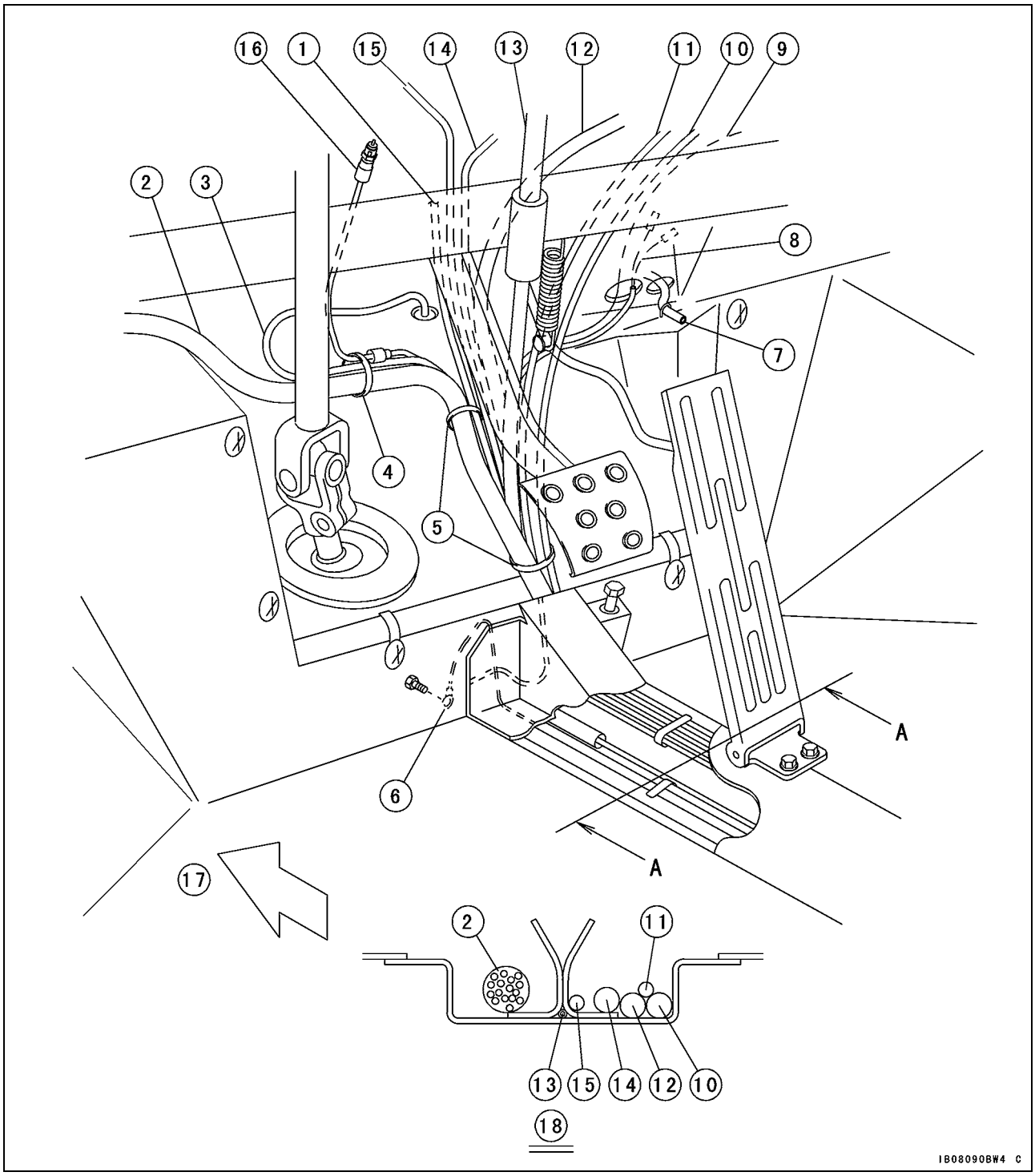
1. Hold the right brake hose with the harness.
2. Right Brake Hose
3. Brake Master Cylinder
4. Keep the brake hose away from the EPS unit.
5. Install the clamp in this direction.
6. Left Brake Hose
7. Front

Cable, Wire, and Hose Routing



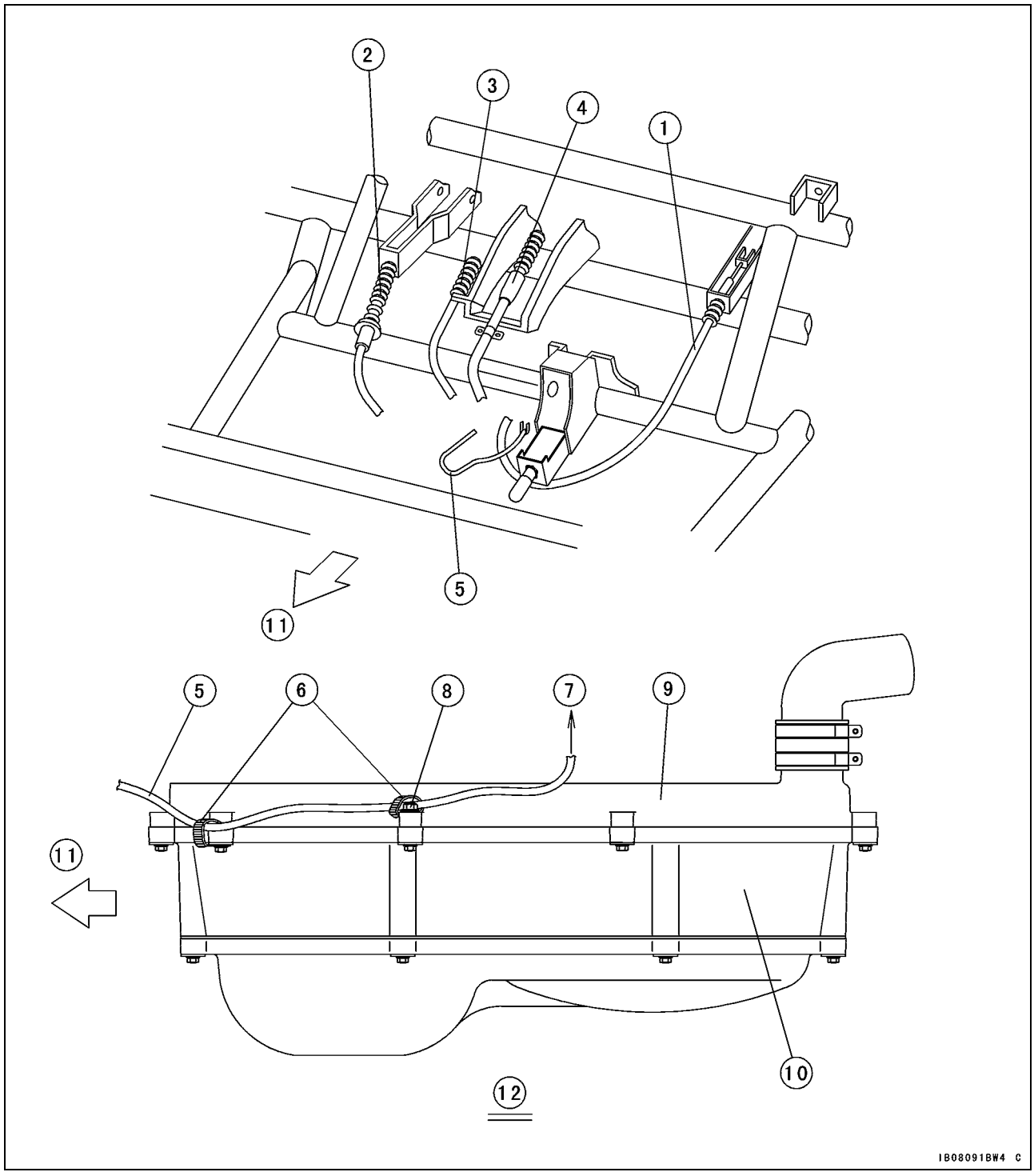
1. EPS 40 A Fuse
2. EPS 7.5 A Fuse
3. Clamp
4. EPS Self-diagnosis System Connector

Cable, Wire, and Hose Routing



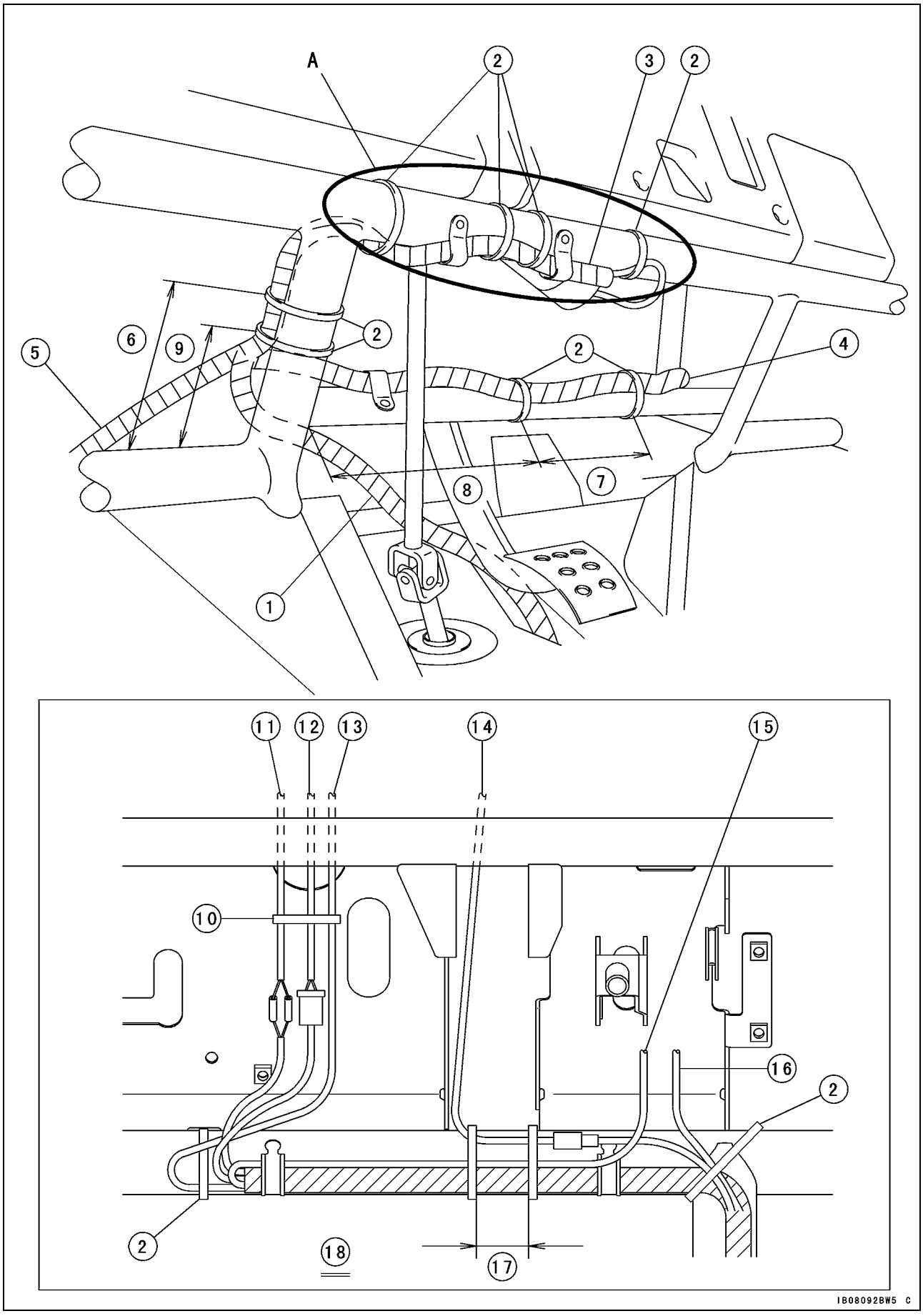
1. Speedometer Cable: Run the speedometer cable to the left of the brake pipe.
2. Main Harness
3. Radiator Fan Lead
4. Band
5. Band
6. Fix the ground lead terminal to the steering gear assembly.
7. Front Gear Case Vent Hose
8. Horn Lead
9. Radiator Fan Switch Lead
10. Hi/Low Shift Cable
11. 2WD/4WD Shift Cable
12. Transmission Shift Cable
13. Brake Pipe
14. Throttle Cable
15. Differential Shift Cable
16. Brake Light Switch Lead
17. Front
18. Section A-A

Cable, Wire, and Hose Routing



1. Differential Shift Cable
2. 2WD/4WD Shift Cable
3. Hi/Low Shift Cable
4. Transmission Shift Cable
5. Throttle Cable
6. Clamp
7. To Engine
8. Nut
9. Torque Converter Case
10. Torque Converter Inner Cover
11. Front
12. Viewed from Top

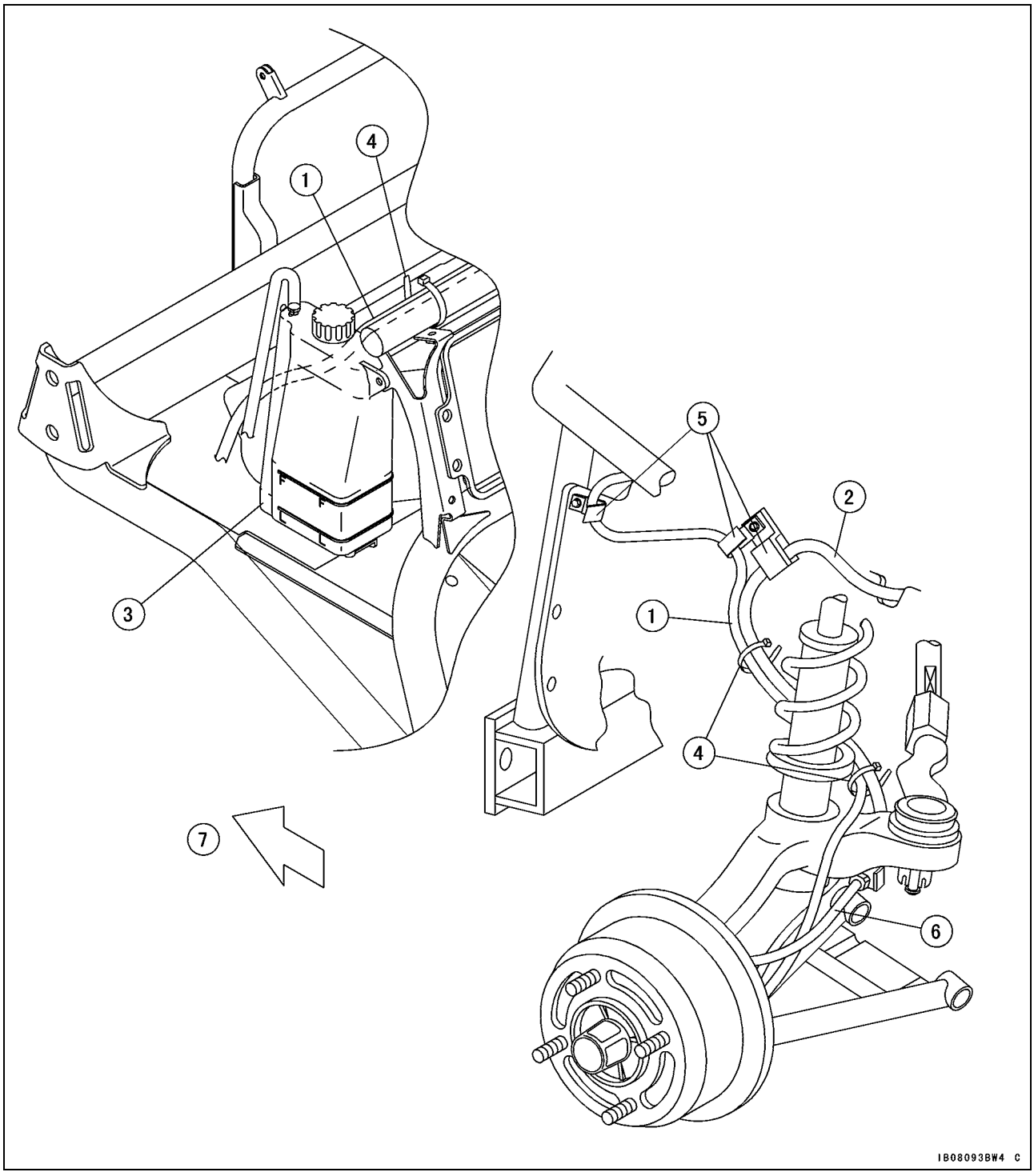
Cable, Wire, and Hose Routing



Cable, Wire, and Hose Routing

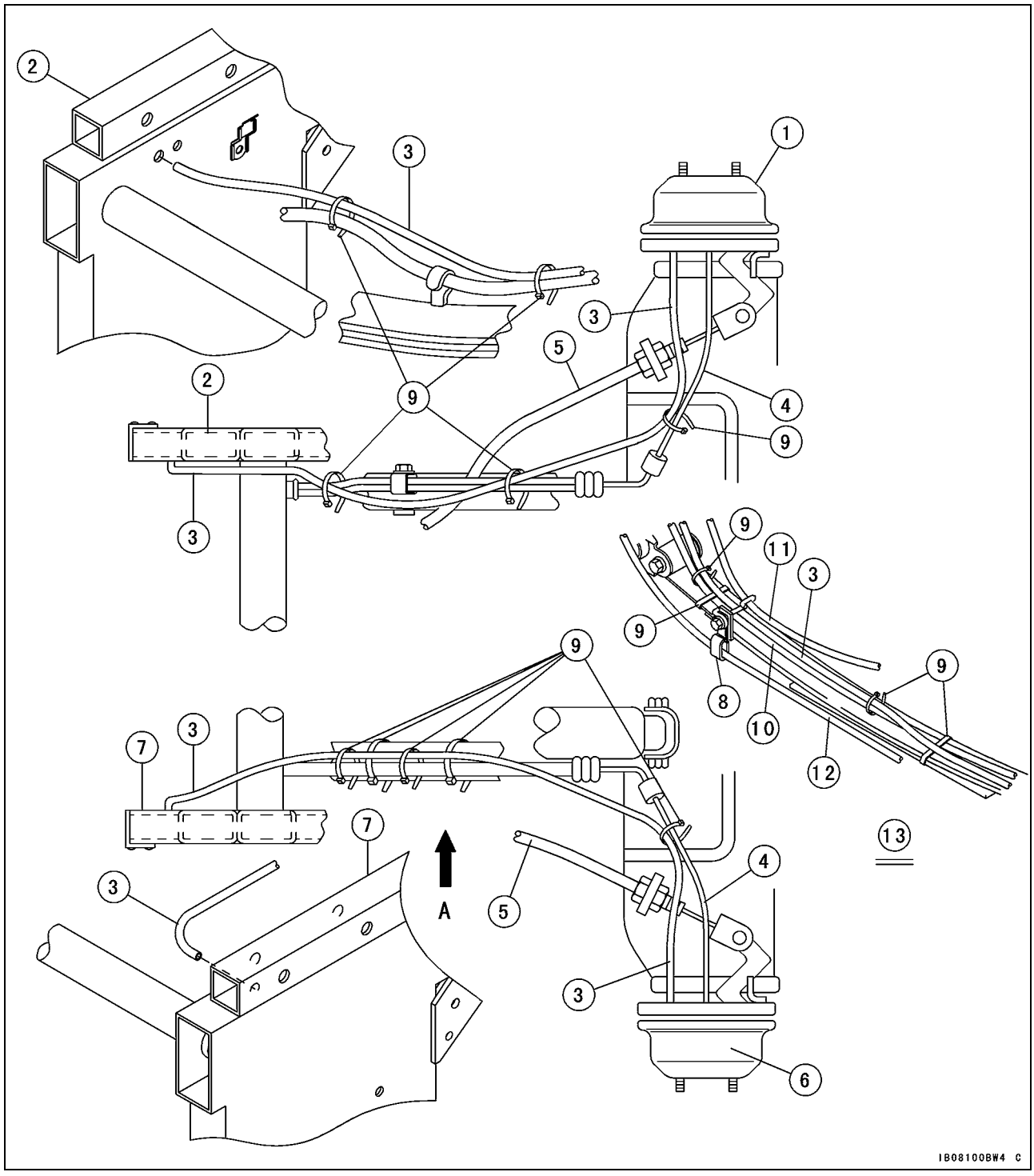
1. Main harness
2. Band
3. To Main Harness
4. To Right Headlight
5. To Left Headlight
6. 110 mm (4.33 in.)
7. 140 mm (5.51 in.)
8. 300 mm (11.81 in.))
9. 80 mm (3.15 in.)
10. Band (Bind the glow plug light, main switch and hour meter leads.)
11. To Glow Plug Light
12. To Main Switch
13. To Hour Meter
14. To Horn Switch (Make sure that horn switch lead has a play, and 15 mm (0.59 in.) or more clearance from the upper universal joint.)
15. To Light Switch
16. To Speedometer Illumination
17. 25 mm (0.98 in.)
18. Detail A (Front View)

Cable, Wire, and Hose Routing



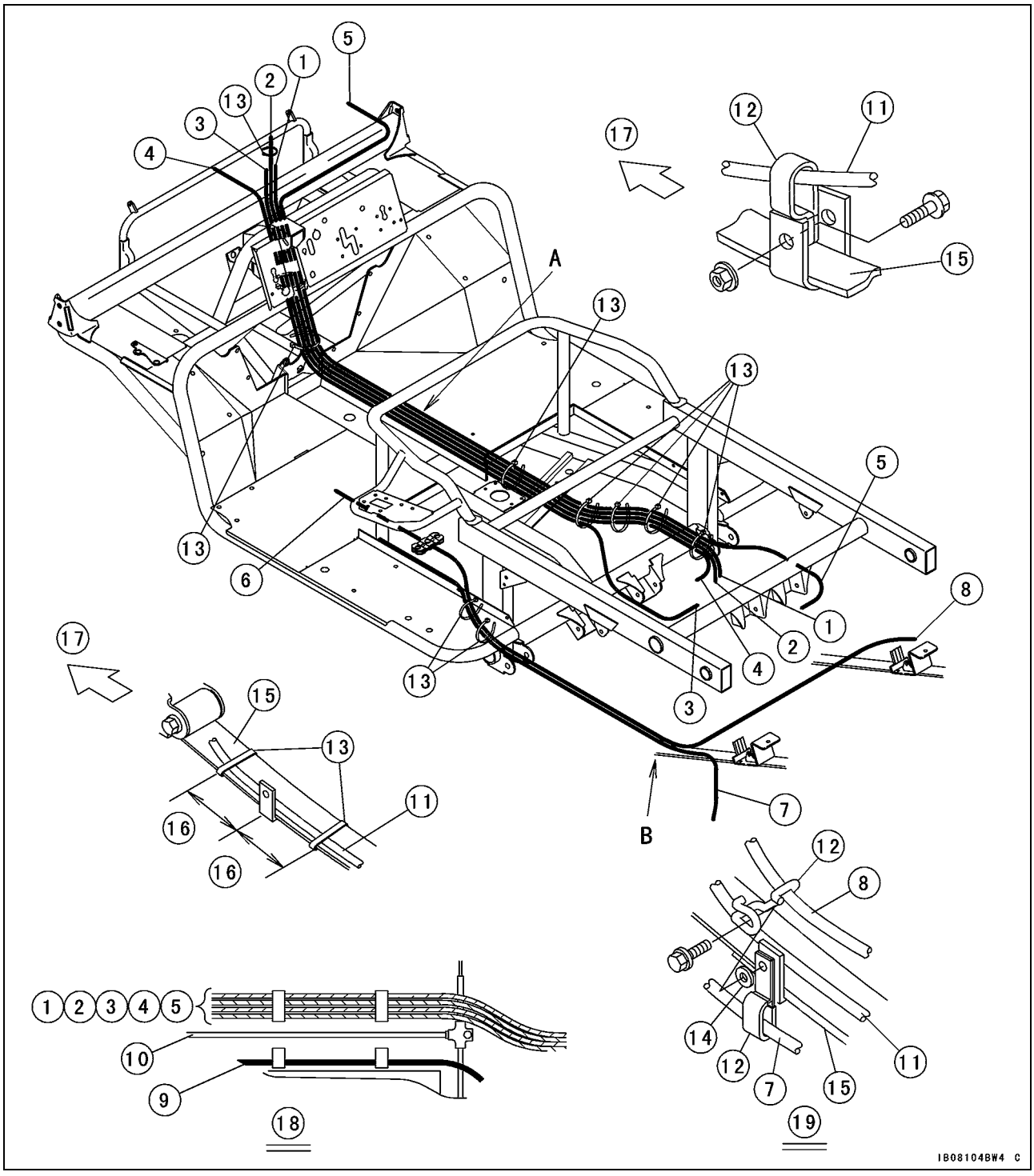
1. Breather Tube
2. Brake Hose
3. Coolant Reserve Tank
4. Band
5. Clamp
6. Brake Pipe
7. Front

Cable, Wire, and Hose Routing



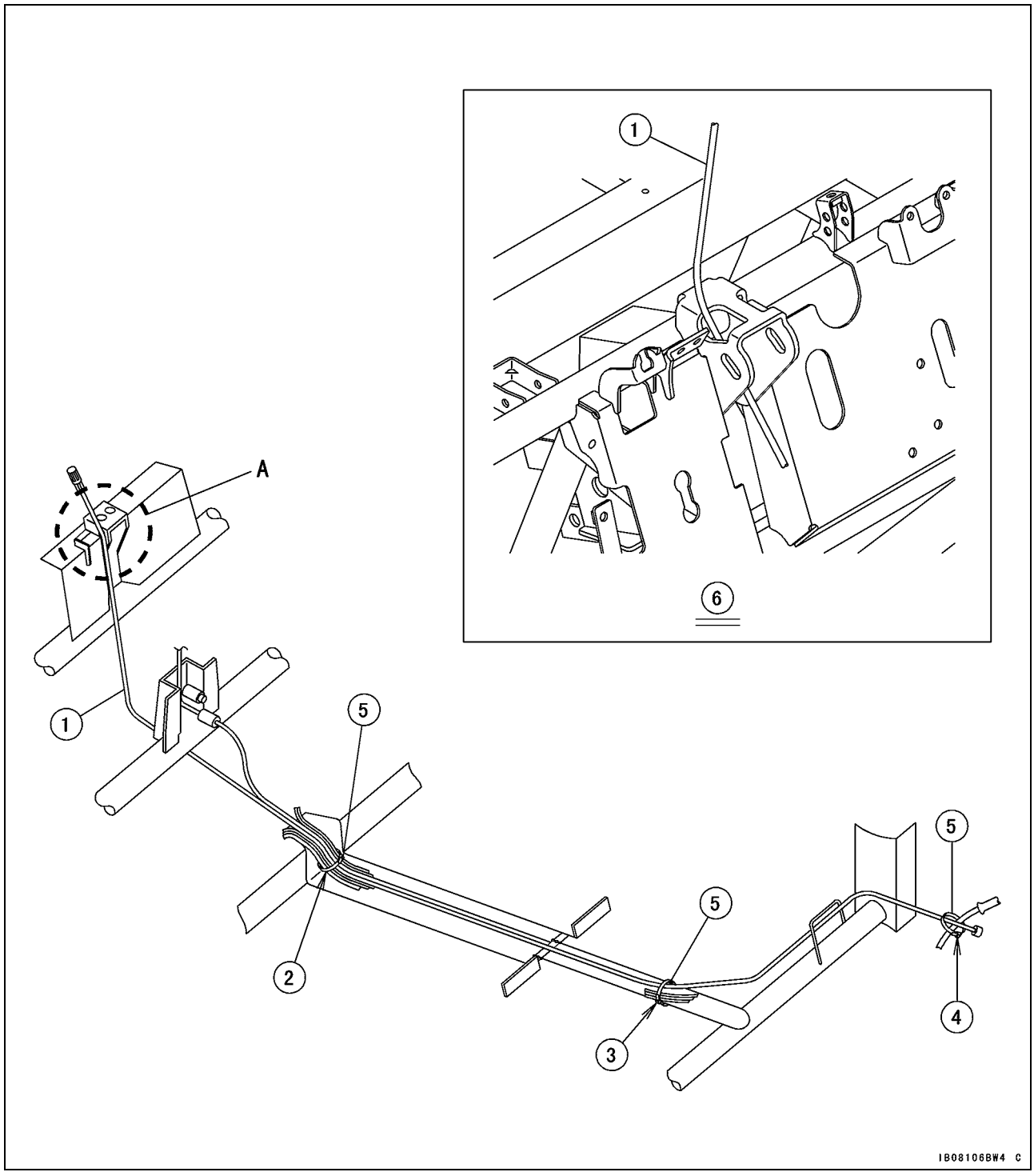
1. Right Brake Drum
2. Right Frame
3. Breather Tube
4. Brake Pipe
5. Brake Cable
6. Left Brake Drum
7. Left Frame
8. Clamp
9. Band
10. Brake Hose
11. Right Parking Brake Cable
12. Left Parking Brake Cable
13. View A

Cable, Wire, and Hose Routing



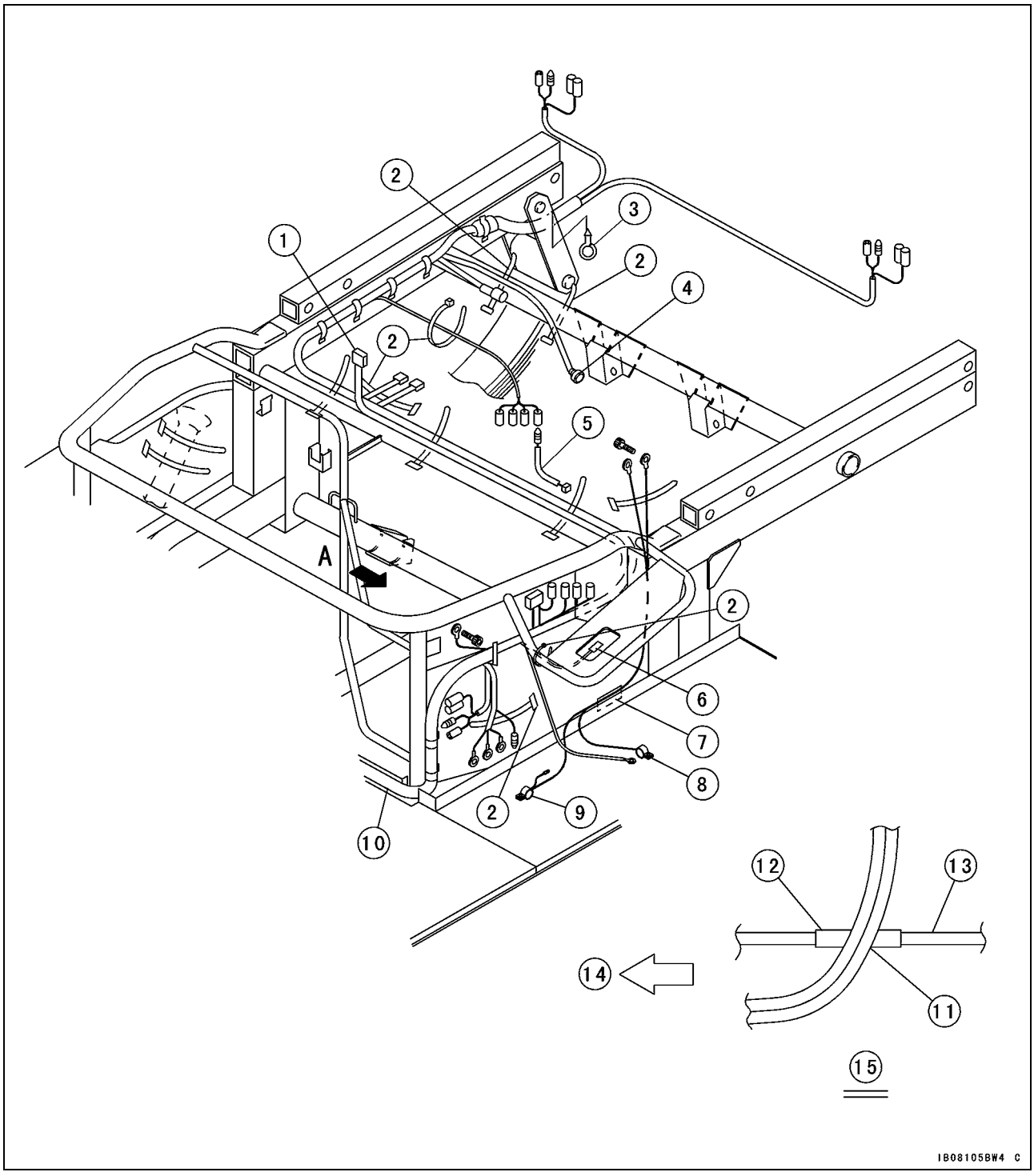
1. Hi/Low Shift Cable
2. Transmission Shift Cable
3. Throttle Cable
4. Differential Shift Cable
5. 2WD/4WD Shift Cable
6. Parking Brake Cable
7. Left Parking Brake Cable
8. Right Parking Brake Cable
9. Main Harness
10. Brake Pipe
11. Brake Hose
12. Clamp
13. Band
14. Install the washer between the clamp and hook.
15. Leaf Spring
16. 50 mm (1.97 in.)
17. Front
18. View A
19. View B

Cable, Wire, and Hose Routing



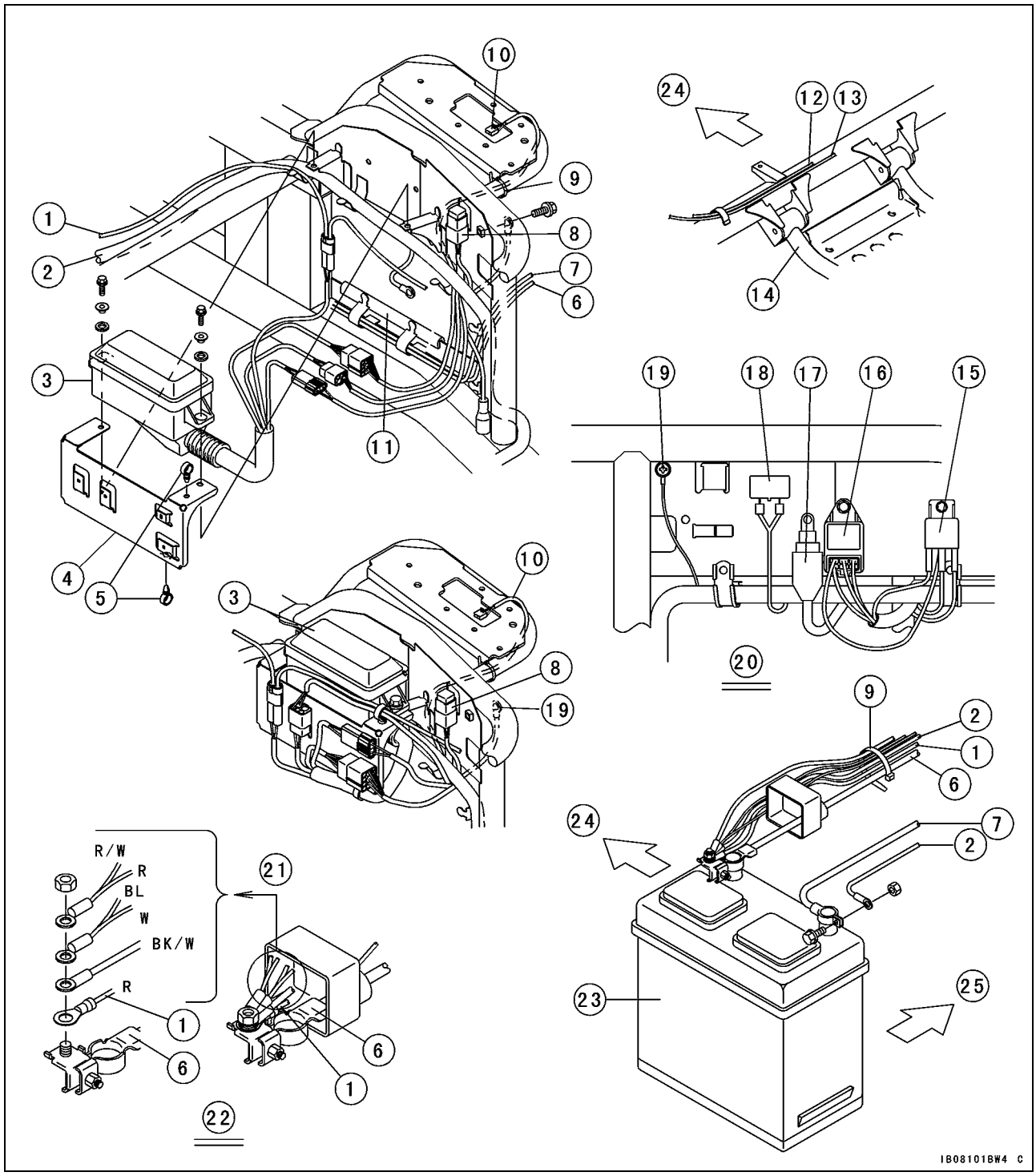
1. Speedometer Cable
2. Clamp the speedometer cable with other cables, harness and brake pipe.
3. Clamp the speedometer cable with other cables.
4. Clamp the speedometer cable with the parking brake cable.
5. Band
6. Detail A

Cable, Wire, and Hose Routing



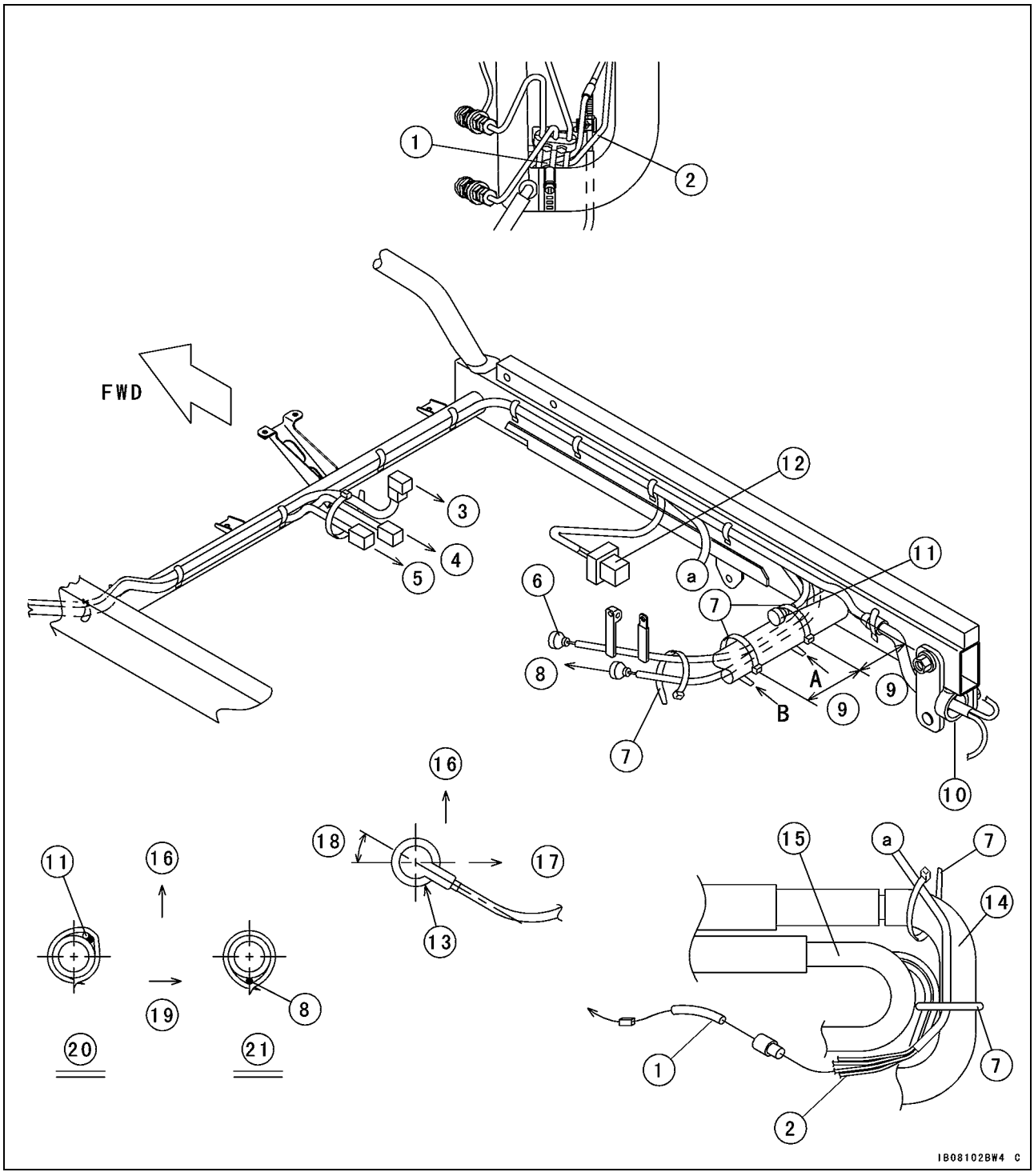
1. Altenator Lead
2. Band
3. Clamp
4. Neutral Switch Lead
5. Oil Pressure Switch Lead
6. Parking Brake Light Switch
7. Trim
8. Battery (–) Cable
9. Battery (+) Cable
10. Main Harness
11. Run the battery leads on the rubber.
12. Rubber Damper
13. Rear Left Brake Pipe
14. Front
15. View A

Cable, Wire, and Hose Routing



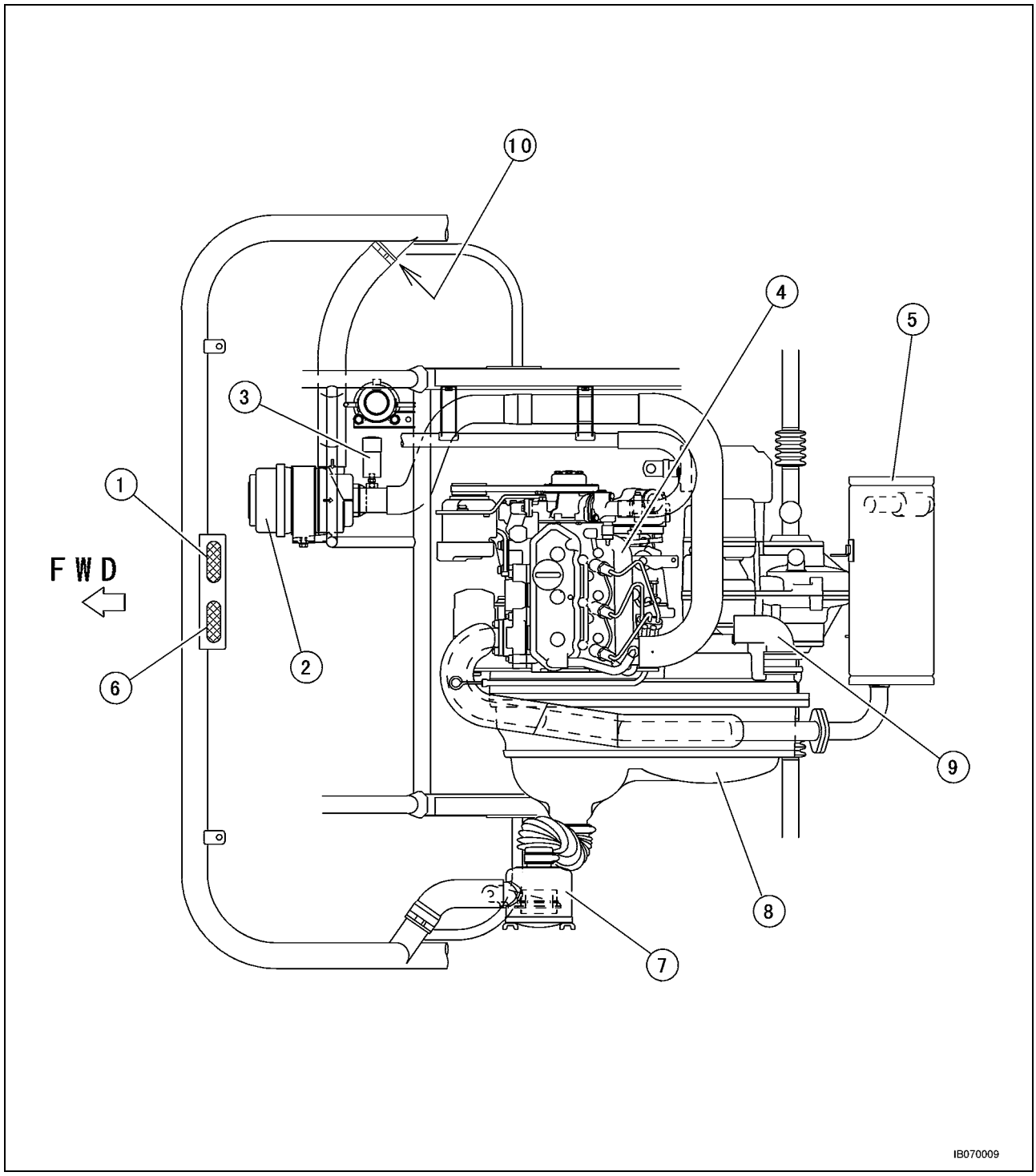
1. Alternator Lead
2. Main Harness
3. Fuse Assembly
4. Holder
5. Clamp
6. Battery (+) Cable
7. Battery (–) Cable
8. Starter Circuit Relay
9. Band
10. Parking Brake Light Switch Lead
11. Trim
12. To Starter Motor (R Lead)
13. To Engine Ground (BK Lead)
14. Rear Frame
15. Glow Plug Relay
16. Preheating Timer
17. Radiator Fan Relay
18. Radiator Fan Breaker
19. Frame Ground Terminal
20. Bracket Behind Battery
21. Pay attention to the directions of leads.
22. Detail of Battery (+) Terminal
23. Battery
24. Front
25. Inside

Cable, Wire, and Hose Routing



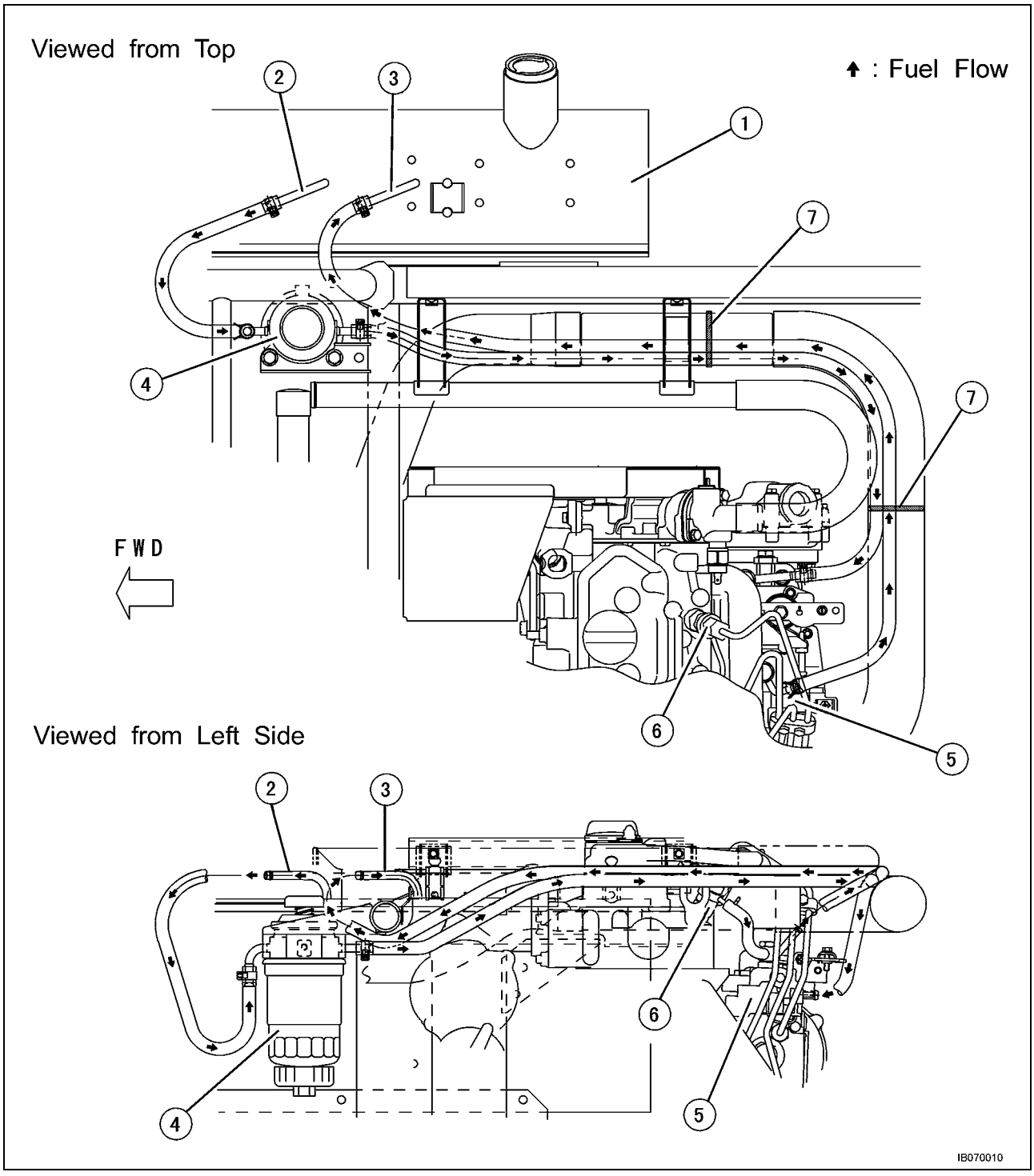
1. Oil Pressure Switch Lead
2. Injection Pump Lead
3. To Alternator (R Lead)
4. To Alternator
5. To Starter Motor
6. Reverse Switch (Europe Model)
7. Band
8. To Neutral Switch
9. 80 mm (3.15 in.)
10. Clamp
11. Accessory Terminal
12. Run the speed sensor lead through inside of the 2WD/4WD shift cable and differential shift cable.
13. Neutral Switch Terminal
14. Air Duct
15. Water Pipe
16. Upper
17. Right
18. 0 ~ 20°
19. Rear
20. Detail A
21. Detail B

Cable, Wire, and Hose Routing



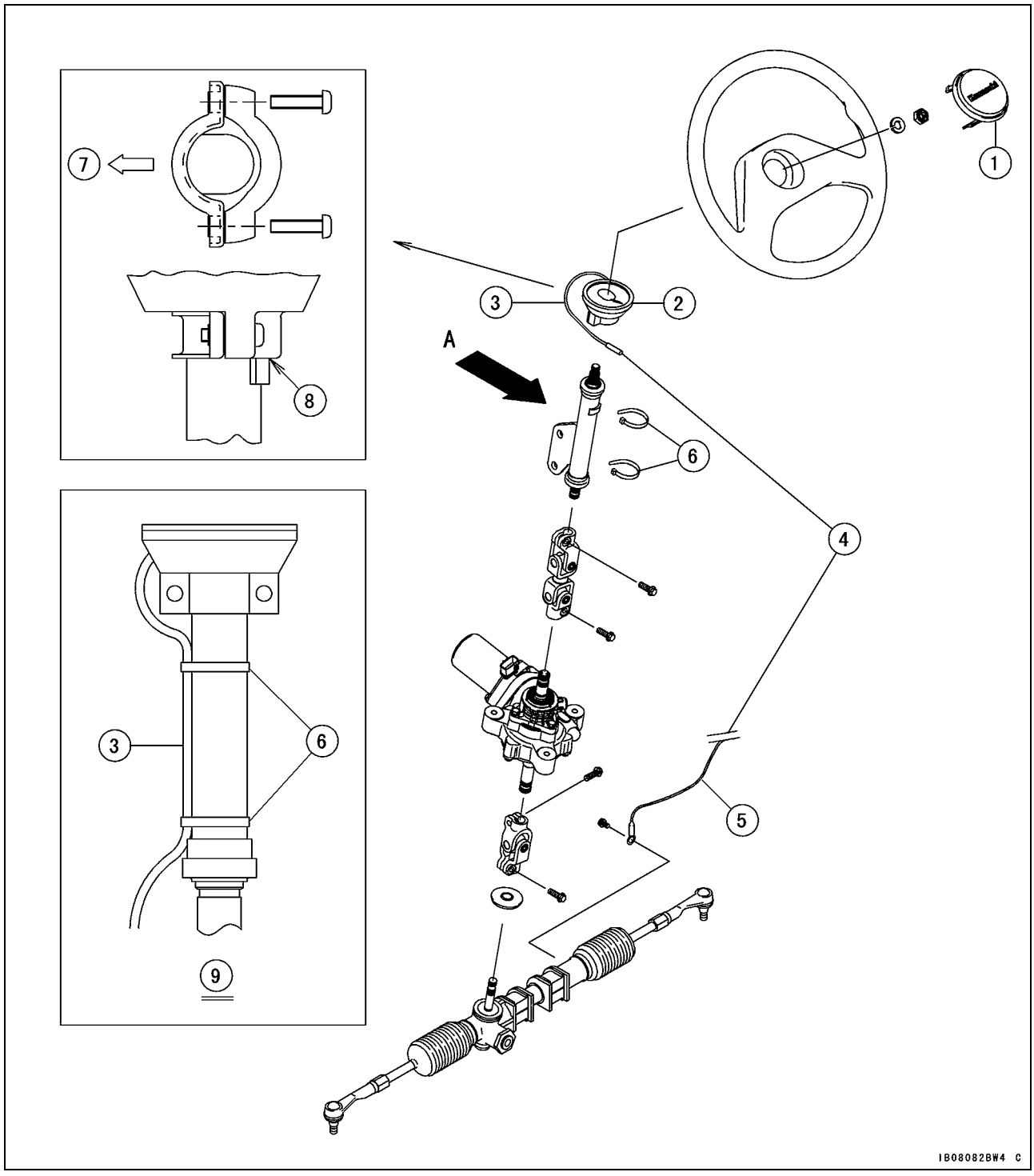
1. Air Intake (for Engine)
2. Air Cleaner (for Engine)
3. Air Filter Restriction Gauge
4. Air Intake Manifold
5. Muffler
6. Air Intake (for Converter)
7. Air Cleaner (for Converter)
8. Converter
9. Duct
10. Tighten the clamp from behind.

Cable, Wire, and Hose Routing



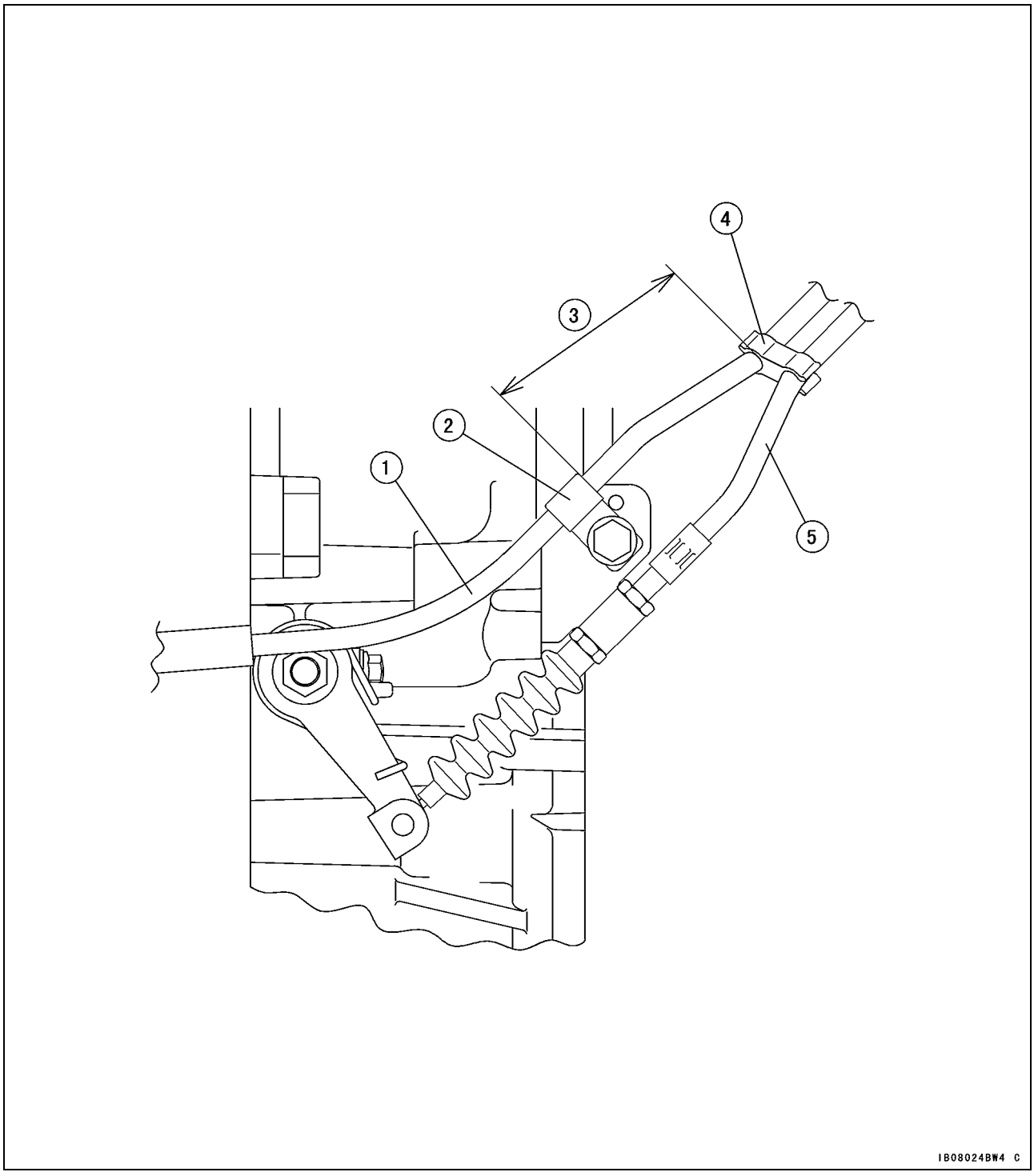
1. Fuel Tank
2. Fuel Supply Pipe
3. Fuel Return Pipe
4. Fuel Filter
5. Fuel Injection Pump
6. Fuel Injection Nozzle
7. Band

Cable, Wire, and Hose Routing



1. Horn Button
2. Horn Switch Contact
3. Run the born switch lead to the straightly down (Do not twist it around the steering shaft).
4. Ground Lead
5. To Main Harness
6. Band
7. Front
8. Installation condition of horn switch contact.
9. View from A

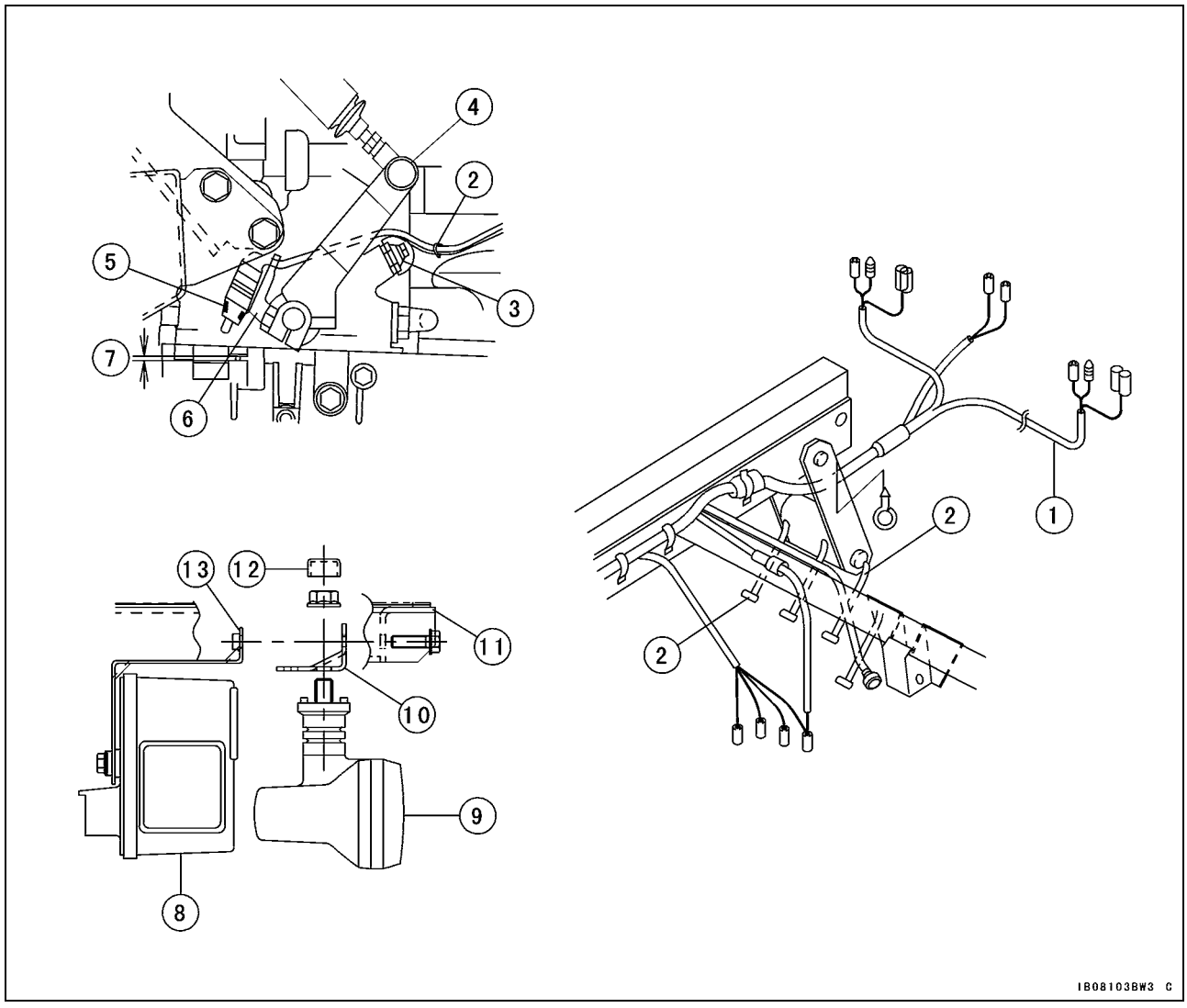
Cable, Wire, and Hose Routing



1. Differential Shift Cable
2. Cable Bracket
3. About 100 mm (3.94 in.)
4. Cable Clamp
5. 2WD/4WD Shift Cable

Cable, Wire, and Hose Routing

Europe Model



1. Tail/Brake Light Lead
2. Band
3. Neutral Switch
4. Shift Lever
5. Reverse Switch
6. Switch Holder
7. Clearance: 1 ~ 2 mm (0.04 ~ 0.08 in.)
   Adjust the switch location to this clearance in shift lever working condition.
8. Tail/Brake Light
9. Reverse Light
10. Bracket
11. Cargo Bed
12. Cap
13. Bracket

Troubleshooting Guide

NOTE

○*This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties.*

Engine Doesn't Start, Starting Difficulty:
Starter motor not rotating:
Neutral switch trouble
Starter motor trouble
Battery voltage low
Relays not contacting or operating
Wiring open or shorted
Main switch trouble
Fuse blown
Starter motor rotating but engine doesn't turn over:
Starter motor trouble
Pinion or ring gear worn
Engine won't turn over:
Valve seizure
Rocker arm seizure
Cylinder, piston seizure
Crankshaft seizure
Connecting rod small end seizure
Connecting rod big end seizure
Camshaft seizure
No fuel flow:
No fuel in tank
Fuel tank air vent obstructed
Fuel injection pump trouble
Fuel filter clogged
Fuel line clogged
Compression low:
Fuel injection nozzle loose
Glow plug loose
Cylinder head not sufficiently tightened down
No valve clearance
Cylinder, piston worn
Piston rings bad (worn, weak, broken, or sticking)
Piston ring/groove clearance excessive
Cylinder head gasket damaged
Cylinder head warped
Valve spring broken or weak
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

Poor Running at Low Speed:
Fuel/air mixture incorrect:
Air cleaner clogged, poorly sealed, or missing
Fuel tank air vent obstructed
Fuel injection pump trouble
Compression low:
Fuel injection nozzle loose
Glow plug loose
Cylinder head not sufficiently tightened down
No valve clearance
Cylinder, piston worn
Piston ring bad (worn, weak, broken, or sticking)
Piston ring/groove clearance excessive
Cylinder head gasket damaged
Cylinder head warped
Valve spring broken or weak
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)
Other:
Engine oil viscosity too high
Front final gear case oil viscosity too high
Drive train trouble
Brake dragging

Poor Running or No Power at High Speed:
Fuel/air mixture incorrect:
Air cleaner clogged, poorly sealed, or missing
Fuel tank air vent obstructed
Fuel line clogged
Fuel injection pump trouble
Compression low:
Fuel injection nozzle loose
Glow plug loose
Cylinder head not sufficiently tightened down
No valve clearance
Cylinder, piston worn
Piston ring bad (worn, weak, broken, or sticking)
Piston ring/groove clearance excessive
Cylinder head gasket damaged
Cylinder head warped
Valve spring broken or weak
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)
Knocking:
Carbon built up in combustion chamber
Fuel poor quality or incorrect

Troubleshooting Guide

Miscellaneous:
Brake dragging
Overheating
Engine oil level too high
Engine oil viscosity too high
Front final gear case oil viscosity too high
Drive train trouble

Overheating:
Fuel/air mixture incorrect:
Air cleaner clogged, poorly sealed, or missing
Compression high:
Carbon built up in combustion chamber
Engine load faulty:
Engine oil level too high
Engine oil viscosity too high
Drive train trouble
Brake dragging
Converter and/or belt excessive heating:
Belt dirty or worn
Drive or driven pulley sheave dirty or worn
Driven pulley spring broken or weak
Drive pulley spring broken or weak
Idle speed too high
Converter fan damaged
Lubrication inadequate:
Engine oil level too low
Engine oil poor quality or incorrect
Front final gear case overheating:
Insufficient oil
Bevel gears maladjusted
LSD clutches maladjustment
Coolant incorrect:
Coolant level too low
Coolant deteriorated
Wrong coolant mixed ratio
Cooling system component incorrect:
Radiator clogged
Thermostat trouble
Radiator cap trouble
Radiator fan switch trouble
Fan motor broken
Fan blade damaged
Water pump not turning
Water pump impeller damaged

Over Cooling:
Radiator fan switch trouble
Thermostat trouble

Converter Operation Faulty:
Belt slipping:
Belt dirty, or worn
Drive or driven pulley sheave dirty or worn
Driven pulley spring broken or weak
Converter engagement speed too low:
Drive pulley spring broken or weak
Converter engagement speed too high:
Belt drive or worn
Drive or driven pulley sheave dirty or worn
Drive pulley weight doesn't move smoothly
Drive pulley movable sheave doesn't move smoothly
Drive or driven pulley movable sheave bush worn
Drive pulley weight or roller worn
Shifting too quickly:
Drive pulley spring weak
Driven pulley spring weak or incorrectly installed (too loose)
Shifting too slowly:
Belt dirty or worn
Drive or driven pulley sheave dirty or worn
Drive pulley weight doesn't move smoothly
Drive pulley movable sheave doesn't move smoothly
Driven pulley spring incorrect installed (too tight)
Driven pulley movable sheave doesn't move smoothly

Gear Shifting Faulty:
Doesn't go into gear:
Shift arm bent or seized
Gear stuck on the shaft
Shift cable maladjusted
Shift cable lubrication inadequate
Shift cable damaged
Jumps out of gear:
Shifter groove worn
Gear dogs worn
Shift arm positioning bolt spring weak or broken
Shift block worn
Transmission shaft, and/or gear splines worn
Shift cable maladjusted
Overshifts:
Shift arm positioning bolt spring weak or broken
Shift cable maladjusted

Abnormal Engine Noise:
Knocking:
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Fuel injection nozzle incorrect
Overheating

Troubleshooting Guide

Piston slap:
Cylinder/piston clearance excessive
Cylinder, piston worn
Connecting rod bent
Piston pin, piston pin hole worn
Valve noise:
Valve clearance incorrect
Valve spring broken or weak
Camshaft bearing worn
Rocker arm push rod runout excessive
Other noise:
Connecting rod small end clearance excessive
Connecting rod big end clearance excessive
Piston ring worn, broken, or stuck
Piston seizure or damaged
Cylinder head gasket leaking
Exhaust pipe leaking at cylinder head connection
Crankshaft runout excessive
Engine mount loose
Crankshaft bearing worn
Cooling fan belt loose

Abnormal Drive Train Noise:
Converter noise:
Belt worn
Drive or driven pulley sheave worn
Drive or driven pulley movable sheave bush worn
Drive or driven pulley mount loose
Driven pulley shoe worn
Drive pulley weight or roller side washer worn
Drive pulley weight or roller worn
Transmission noise:
Bearings worn
Transmission gear worn or chipped
Metal chips jammed in gear teeth
Transmission oil insufficient
Final drive noise:
Bearing worn
Gears worn or chipped
Metal chips jammed in gear teeth
Insufficient lubricant
Bevel gears maladjusted
LSD clutch friction plate worn
LSD clutch spring worn
Universal joint damaged

Abnormal Frame Noise:
Shock absorber noise:
Shock absorber damaged
Brake noise:
Brake linings overworn or worn unevenly
Drum worn unevenly or scored
Brake spring(s) weak or broken
Foreign matter in hub
Brake not properly adjusted
Other noise:
Bracket, nut, bolt, etc. not properly mounted or tightened

Exhaust Smokes Excessively:
White smoke:
Piston oil ring worn
Cylinder worn
Valve oil seal damaged
Valve guide worn
Engine oil level too high
Black smoke:
Air cleaner clogged
Brown smoke:
Air cleaner poorly sealed or missing

Handling and/or Stability Unsatisfactory:
Steering wheel hard to turn:
Steering shaft bearing damaged
Steering shaft lubrication inadequate
Steering shaft bent
Steering gear assembly damaged
Tire air pressure too low
LSD clutch maladjusted
EPS unit trouble
EPS ECU trouble
Noise when turning:
Damaged side gear or pinion (front final gear case)
Worn clutch friction plate (front final gear case)
Worn clutch spring (front final gear case)
ESP unit mount loose
Steering wheel shakes or excessively vibrates:
Tire(s) worn
Suspension arm bushing worn
Tie-rod joint worn
Wheel rim warped
Axle shaft bearing worn
Steering wheel mount loose
Steering bolt or nut loose
Steering wheel pulls to one side:
Frame bent
Wheel misalignment
Suspension arm bent or twisted
Steering shaft bent
Steering gear assembly damaged
Front or rear tire air pressure unbalanced
Shock absorber unbalanced

Troubleshooting Guide

Shock absorption unsatisfactory:
(Too hard)
Tire air pressure too high
Shock absorber damaged
(Too soft)
Tire air pressure too low
Shock absorber oil leaking
Shock absorber spring weak

Brake Doesn't Hold:
Air in the brake line
Brake fluid leakage
Brake fluid deteriorated
Primary or secondary cup trouble
Master or wheel cylinder scratched inside
Brake not properly adjusted
Linings overworn or worn unevenly
Drum worn unevenly or scored
Oil, grease on lining and drum
Dirt, water between lining and drum
Overheated brakes

Battery Trouble:
Battery discharged:
Battery faulty
Battery cable making poor contact
Load excessive (e.g., bulb of excessive wattage)
Main switch trouble
Alternator trouble
Wiring faulty

Battery overcharged:
Alternator trouble
Battery faulty

MODEL APPLICATION

Year	Model	Beginning Frame No.
2008	KAF950D8F	JK1AFDD□8B500001 JK1AF950DDB600001

□:This digit in the frame number changes from one machine to another.

Kawasaki
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